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A BUREAUCRAT'S GUIDE TO WORD PROCESSING

Now, if it were you or I and we wanted a word processing program for our IBM-type PC, we'd probably stop off at our local computer store and simply diddle with a few.

You and I, however, are not the U.S. Department of Agriculture.

(Nor any of its permutations of subsystems like the Economic Research Service, National Resources Economics Division, Data Services Center, etc., etc.)

So when the USDA told ERS to tell NRED and DSC to look into a truckload of w.p. programs for all their PCs, the last thing they wanted was simple diddling. Their dedicated Wangs and Lexitrons were far too few to handle their needs, their IBM® PCs weren't compatible with them anyway, and nobody really, quantifiably, knew from word processing with a personal computer.

Definitely not a diddling-mode condition.

As they put it in The Exchange, an internally distributed publication of the Department of Agriculture: "A needs assessment showed that, in the long-term, a word processing system is needed that can increase word processing capability and also be compatible with ERS' Long Range Information Management goals."

Well, "Needs assessment" led swiftly to "procurement action," which galloped into an "objective review" of the eight top-rated PC programs on the market (as compiled by The Ratings Book published by Software Digest), along with WordStar® and Display Write 2, because they had some around.

Thus armed with the names, the final evaluators (a team of secretaries from NRED who would be the primary users of the PC software) became armed with each of the programs, along with checklists to record such things as ease of use, advanced features, and similarity to their existing dedicated equipment.

Since NRED has some hard disk base systems, any packages that were copy-protected could not be transferred to the hard disks, and were eliminated on that basis alone. OfficeWriter™ and SAMNA WORD™ II were the first to go.

Next, IBM's Diplay Write 2: because it's "not compatible with other software used in ERS (like Lotus™ 1-2-3,™ dBase II,® etc.)," and it's "full of confusing menu options and cryptic error messages." Au revoir IBM.

Then, three more, for a variety of reasons. Which left:

Volkswriter® Deluxe™
MultiMate™
Leading Edge™

Volkswriter® Deluxe? "Too complicated and confusing." Not "easy to learn or use."

MultiMate? Not bad. It actually tied the winner in a few categories.

The winner being the one that won 82% of the votes in the Ease of Use/Ease of Learning categories. The one about which they said, "The ability to store deleted text and automatic document backup features were both highly desirable." The one they thought they'd quickly "be able to use . . . for their day-to-day word processing tasks."

The whole process took some three months of work by people in DSC to support the NRED in its work with the ERS and DSC to make the world a better place for the USDA.

But the results were well worth the wait. Because at last they've solved their word-processing problems . . .

"With Leading Edge!"

THESE ARE THE PACKAGES THE COMMITTEE EVALUATED:

THESE WERE THE FINALISTS:

THIS WAS THE WINNER:
LEADING EDGE™
LEADING EDGE WORD PROCESSING

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LEADING EDGE SOFTWARE DIVISION, 21 HIGHLAND CIRCLE, NEEDHAM, MA 02194-0009 TEL. 800-343-3436, (617) 449-4655
HELP HOTLINE 800-523-HELP

ALL YE NEED KNOW.

Like:

"How many boxes of 'Trivial Pursuit' we got left in the West Coast warehouse?"

"Mr. Jones, your expense account just set an IRS record. Can you explain how, where, and with whom you managed to spend $12,648 on 'client entertainment'? In one week?"

"Listen, Eddie, we own 1,400 stores, and you're telling me you can't find one lousy Cabbage Patch doll?"

"We got any dealers in New England with a new Chevy Citation on the lot in metallic silver, blue interior, and stereo with cassette deck?"

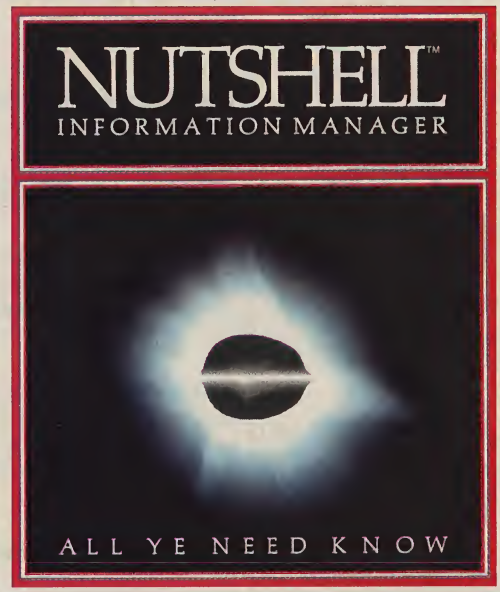
"Of all the furniture we sell, how many pieces in the $600 to $800 range haven't turned over this month?"

"I met this distributor in Chicago who wants to order a million units, and his name is McTavish or McCormack or McMurphy or McCarthy or something, and silly me, I lost the napkin I wrote his name on . . ."

And so on.

And so . . .

THE NUTSHELL™ INFORMATION MANAGER.



It stores and cross references any data your business depends upon—once an hour or once in a lifetime—and lets you get at it and use it in an instant.

It's an information-management software package created to take full advantage of all the power inherent—but until now never tapped—in sophisticated personal computers like an IBM® PC (upgraded to 256K) or a Leading Edge™ PC.

And it spans a major gap: Between toys that act like glorified file cabinets, on the one hand; and costly, complicated database management systems, on the other.

Now, the Nutshell™ doesn't pretend to give you all the information in the world. Just all the information you need, in any form you need it: inventory lists, invoices, sales reports, salary summaries, customer histories—with fields of virtually unlimited length—on the screen, or in printed reports.

To be sure, it's similar to a giant file cabinet. (In fact, depending upon your computer, its paper equivalent could be some 2 billion separate records, or 2 miles of printed information.) But there the similarities cease. Because you can access any data in any of those files by the most incredible cross-indexing system ever conceived for a PC. You can call up information by file name, date, prices, part number, manufacturer, description (like "red"), and a dozen other different ways in seconds.

Even if you forgot you had it.

Remember the incident concerning McTavish, McCormack, McEtc?

All you have to do is type in the first few letters of any name you want to recall (like "Mc") and every word in every file that starts with "Mc" pops up on the screen.

So you find "McGuire" and, along with his name, his million-unit order.

Where were you on that weird week of March 5, 1984 when you managed to expense $12,648? Type in 3/5/84 (or "$12,648" or "Polo Club"), and . . . here's your answer, Mr. Tax Man.

You can even selectively withhold certain information for display. (For example, you could show a customer every house your real-estate agency has for sale, without showing the owner's very lowest acceptance price.)

EASY TO DO. HARD TO DO WITHOUT.

Thanks to an instruction disk that leads you through practice lessons, and on-screen menus that let you choose what you want and tell you how to get it, the Nutshell is one of the easiest-to-learn programs ever designed.

And once you learn it, you'll never want to be without it.

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Inquiry 43

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COLUMNS

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SPECIAL REPORT: LOW-COST COMPUTING

FEATURES

HARDWARE REVIEWS

Vol. 4 No. 4 February 1985

HARDWARE REVIEWS

SOFTWARE REVIEWS

DEPARTMENTS

On the Cover:
Epson QX-16: Painting
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Popular Computing is published monthly by McGraw-Hill Inc., with offices at 70 Main St, Peterborough, NH 03458. Office hours: Mon- Thur 8:30 a.m.-4:30 p.m., Friday 8:30 a.m.- Noon, Eastern Time. Address all mail except subscriptions to POB 397, Hancock, NH 03449: phone (603) 924-9281. Address all subscriptions to Popular Computing, POB 307, Martinsville, NJ 08836. **Postmaster:** Send all changes of address to Popular Computing, POB 387, Martinsville, NJ 08836. Address all freight shipments to 70 Main St, Peterborough, NH 03458. Second-class postage paid at Peterborough, NH 03458 and additional mailing offices. (ISSN 0279-4721). Subscriptions are $15.00 for one year in USA and its possessions. In Canada and Mexico, $18.00 for one year. In Japan, 10,400 yen for one year surface delivery, 19,700 yen for one year air delivered. Other foreign countries $21.00 for one year surface delivery. Single copy price is $2.50 in the USA and its possessions, $2.95 in Canada and Mexico, $4 in Europe, and $4.50 elsewhere. Foreign subscriptions and sales should be remitted in United States funds drawn on a US bank. Printed in United States of America. Address all editorial correspondence to the editor at Popular Computing, POB 397, Hancock, NH 03449. Unacceptable manuscripts will be returned if accompanied by sufficient first-class postage. Not responsible for lost manuscripts or photos. Opinions expressed by the authors are not necessarily those of Popular Computing.

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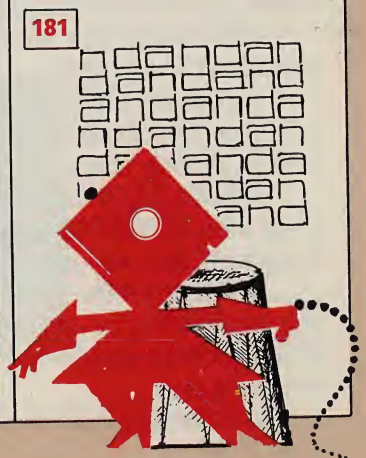

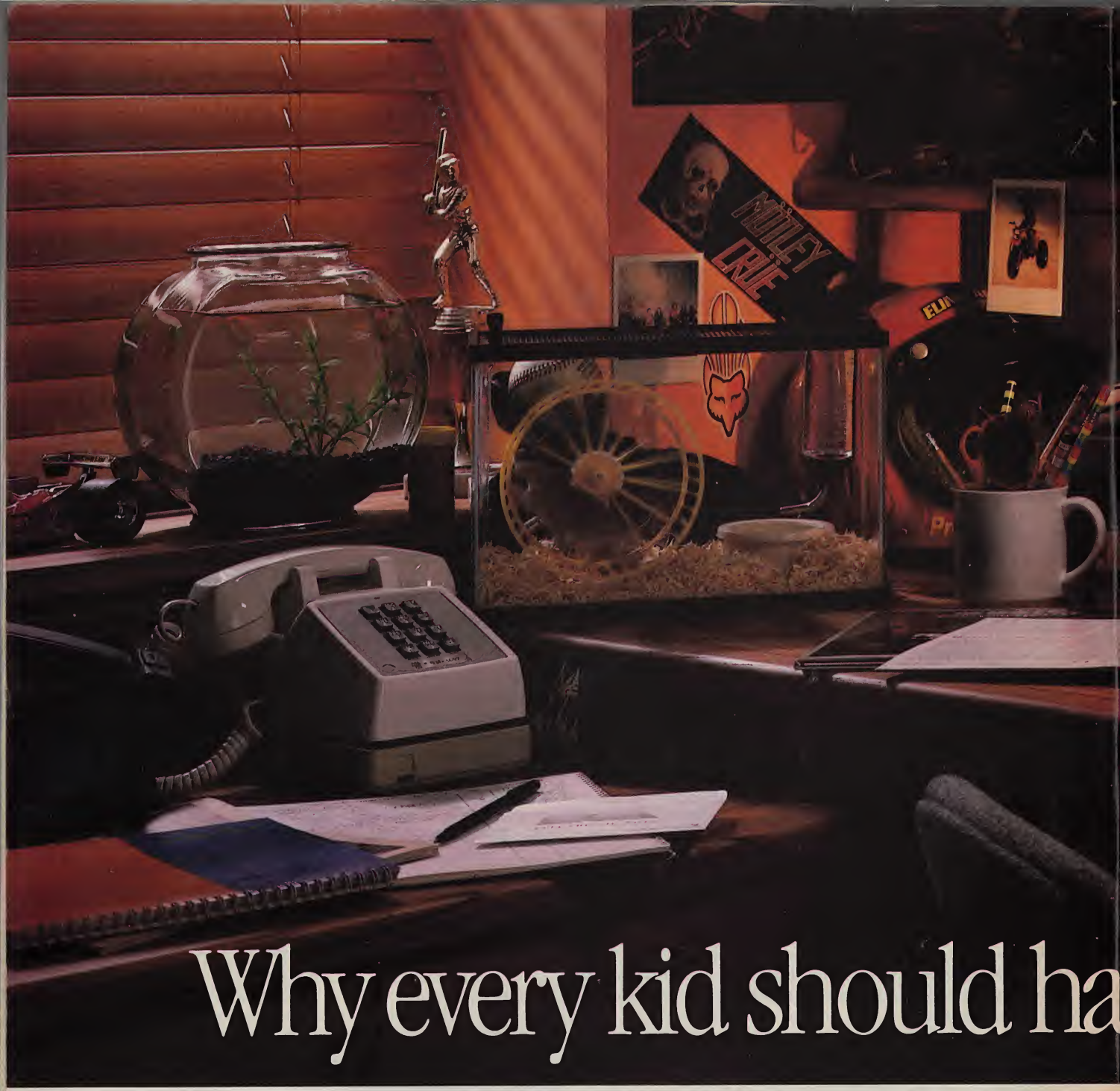

Why every kid should ha

Today, there are more Apples in schools than any other computer.

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ve an Apple after school.

"Enzyme Kinetics."

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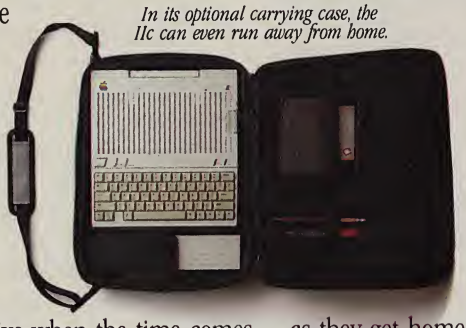

So while your children's shoe sizes and appetites continue to grow at an alarming rate, there's one thing you know can keep up with them. Their Apple IIc.

To learn more about it, visit any authorized Apple dealer. Or talk to your own computer experts.

As soon as they get home from school.

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Personal Technology

Face it—our fascination with the microcomputer is baffling. Opinions vary widely on what we are trying to prove by buying and using the machine, but most experts explain that we *always* look to technology to solve our problems. Indeed, that is why we started using large computers in the business world.

Computer technology was promoted as a way to increase productivity and profits by giving management tighter control over business operations. Corporations began establishing management information systems (MIS) with the computer as the technological solution to the problem. The implementation of that solution, however, created an incredible bureaucracy, leaving the decisions about who gets what information at what time in the hands of a hierarchy of centralized staff.

MIS didn't deliver on its promise. Instead of increased efficiency, workers muttered nasty comments about those folks in the computer room, large stacks of striped paper gathered dust on desks, and a distrust of data processing and its associated technology grew.

Those managers supposedly reaping the benefits of the system received information regulated by someone else's perceptions of their needs. Decisions about the type of information, its format, and its delivery remained in the hands of a growing impersonal bureaucracy. Most workers, even the early enthusiasts, quickly lost interest. And no one identified the real problem until another technological solution, the microcomputer, arrived in the office.

The personal computer made the same promises that MIS did, but it included a very important difference—intimate involvement in the process. No centralized departments, no intermediaries, no bureaucratic structures were necessary. This solution was worker control of the hardware, the software, the operation; no longer were workers merely receivers of an end product, they were creators, manipulators, and owners. The microcomputer in the office was about as far from the original concept of an MIS as we could get.

And it worked. Whether processing words, calculating numbers and formulas, or tracking obscure bits of data, it brought information to management to a greater degree than ever before. It wasn't a systems approach—it was personal.

And while the information flowed, the microcomputer was quietly influencing another change that would positively affect productivity and profits. Microcomputer users experienced a sense of personal accomplishment and pleasure. Not only was the machine helping them do more in less time, it simultaneously seduced them into taking on even more tasks.

So once again, technology comes to the rescue, but its success is clothed in a very different guise than was originally envisioned: the power of the computer, as a technological solution to a problem, turned out to be only part of the answer. The MIS computers are a perfect example. They belong to an organization, where only a few insiders who deal with the day-to-day operation of the machines feel any intimate involvement with the process. This is the dark side of technological solutions—a totally automated, impersonal society.

We want *personal* technology, something that we can control and feel a part of. Critics will accuse us of suffering from a severe case of technolust, but we can always point to our increased rate of productivity as a universally acceptable rationale. And one day, we may experience a great sense of relief when everyone else understands our need to possess not only the power of technology, but the technological tool itself.

Pamela Clark

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LETTERS

Psychological Differences

Dear Editor:

I am, like most amateurs in a field, likely to believe what I read until the publication in question decides to write about areas of which I have information.

Regarding the November 1984 Micro Revolution column by Jerry Pournelle, I would like to address that portion of the article dealing with the Minnesota Multiphasic Personality Inventory (MMPI). I hardly know where to start since every paragraph dealing with the MMPI has either a misstatement of fact, a misinterpretation of fact, or a confusion of fact.

First of all, Mr. Pournelle repeatedly refers to the "495 items" on the MMPI. The card version of the test, as it was first published, had 560 items. The booklet form of the test has since that date had 566 items. The full test has had, does now have, and very likely in the future will contain 566 items. On occasion, individual evaluators may restrict the booklet to a shorter list but that is not the full form of the test, and to so state is an error.

Next, Mr. Pournelle says that "medical tests tend to be pretty reliable." This statement is followed with some examples. Anyone who has worked in and about a school of medicine would understand that that is not a categorically true statement, as presented by Mr. Pournelle. The statement that medical diagnosis lies in the objective truth is equally as open to question. Reliability studies on medical diagnoses have over the years demonstrated clearly a reliability coefficient of approximately 0.60 to 0.70. This reliability coefficient is not discriminably different from psychological or psychiatric diagnoses. Much more importantly, his statement "Even the best psychological tests are not reliable" must be based either on ignorance, misinformation, or just plain wrongheadedness.

Mr. Pournelle's sweeping statements regarding the utility of the test, its ability to make predictions about behavior, and its reliability and validity are flatly at variance with literally thousands of publications on the MMPI. I shall not further discuss individual statements other than to refer you to a group of publications comparing "clinical" and "actuarial" predictions of behavior from the MMPI. The former is based on individual clinicians reading the instrument and making predictions; the latter is based on actuarial predictions essentially computer based in concept if not in fact. The predictive ability of the MMPI is solidly established if one looks at the data.

I can only assume, having read the article carefully, that Mr. Pournelle either wrote it without concerning himself with the facts or he relied on a single source of information—one who may have had a jaundiced and biased view of the psychological testing. In any event, the sweep of his denunciations are at the very least shameful and misleading.

Alexander C. Rosen, Ph.D.
Professor, Biobehavioral Sciences
(Medical Psychology)
University of California, Los Angeles
Neuropsychiatric Institute
Center for the Health Sciences

Dr. Rosen's letter is an excellent example of why I don't think much of the social "sciences." If his methods of argument are typical of professors in our major universities—and alas, they may be—then I fear for the Republic. Instead of rational argument, Rosen prefers arm-waving, name-calling, and accusation.

He begins with a diatribe. He says there are so many errors in my article that he doesn't know where to begin. We are led to believe he will have no difficulty furnishing examples.

He starts with an actual, if trivial, error. I am prepared to believe that the MMPI has 566 items rather than 495 as I stated. I took my number from a venerable work, Cronbach's Essentials of Psychological Testing, *which was used as a text at both the University of Iowa and the University of Washington when I studied psychology. Cronbach states: "The self-report test most promising for diagnosing abnormal personality patterns in the clinic is the MMPI. This test consists of 495 questions . . ." The book was at hand, and I wanted to give a number. I could as easily have said "several hundred" items; if it will make Dr. Rosen feel better, he's welcome to make the change.*

Rosen then takes my statement that "medical tests tend to be pretty reliable" and launches into a paragraph on medical diagnosis. *Surely Dr. Rosen knows that this confuses the test instrument with the final product. If Rosen means that physicians are accustomed to believe that temperature, heart rate, heart murmur, blood sugar, and other diagnostic tests are as unreliable as psychological testing instruments, he's just plain wrong.*

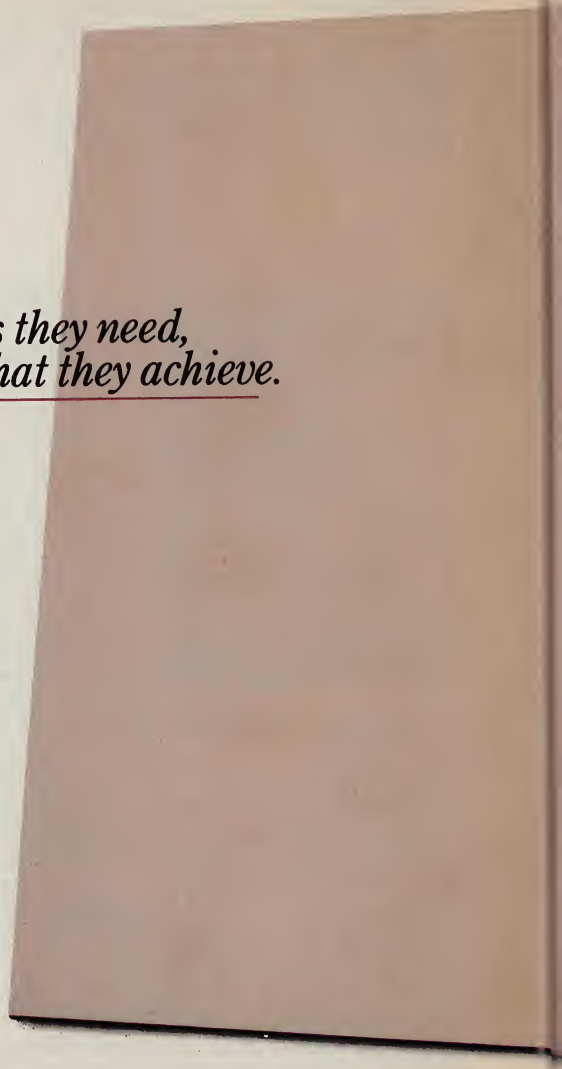
Psychological tests are not *very reliable. The reliability problem has troubled three generations of experimental psychologists. Rosen says that psychological diagnoses have reliability coefficients of 0.6 to 0.7. I could find evidence to dispute that, but let's concede it. A reliability coefficient of "0.6 to 0.7" means that from 36% to 49% of the variance in test scores is accounted for by something the test actually measures; the rest of the variance is due to unknown factors. (This is an elementary fact of statistics derived from the definition of a correlation coefficient. For evidence that a reliability is a correlation coefficient, see any standard textbook on psychological tests and measures.)*

In my article I said that "the best psychological test scores vary by 20% and more from chance alone." That corresponds to a reliability of .8 to .9 (depending on one's exact use of the word "vary" in that sentence).

The measurement of test reliability is fraught with danger. There isn't even agreement on a definition. Psychologists use a number of measures: split item, in which scores on half the items are correlated with those obtained from the other half; test-retest, in which the same test is given to the same people on different days; and such like. All have problems.

This is to break a butterfly on the wheel. I cannot believe

Give people the tools they need, and there is no limit to what they achieve.



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WordStar 2000 gives you the works.

"Windows" allows you to work on different documents—simultaneously. "Undo" lets you replace text you mistakenly removed. A built-in spelling corrector checks and corrects misspellings from over 97% of the most commonly used words.

WordStar 2000 also has a "typewriter mode" to fill in forms or envelopes easily. Plus "format sheets," which give you ready-made headings, tabs and margins at the touch of one key. It can even create and update footnotes.

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LETTERS

that Rosen is unaware of the political and judicial problems associated with using psychological tests to classify people. Anyone aware of the "IQ" debates must know that psychological testing has had a rough time lately. The issue becomes even more serious when psychologists attempt to spot potential *criminals and antisocial personalities with tests administered en masse. People's lives are affected by these tests—yet their reliability, much less their validity, remains at best a matter of controversy.*

Having obfuscated the reliability issue, Rosen does, finally, get to the heart of the matter when he admits that there is a difference between "clinical" and "actuarial" predictions of behavior from the MMPI and other such test instruments. Of course there are. My whole column was built around this elementary fact.

A "clinical" evaluation is one done by an actual human being who studies the patient. The clinician is free to take into account all kinds of cues, such as quirks, tics, appearance, voice tone, grooming or lack thereof, and many other such factors. This kind of diagnosis may be useful; it may even be indispensable; but it isn't science.

Science, by definition, is public and repeatable. Individual clinical diagnosis, by definition, is not.

Although you'd never figure it out from Rosen's letter, my column was about the difficulties of using computers to interpret psychological tests. I said, "The MMPI works pretty well as a screening instrument to find real problem cases." I left open its value to clinicians; and I said nothing at all about its use for "actuarial" predictions of behavior.

What I was concerned about—and the fact that Rosen is a Professor of Medical Psychology at UCLA makes me realize just how well founded my concern was—is the application of computerized "actuarial" predictions to individual people in ways that adversely affect their lives. A reliability of .8 is simply not good enough when the test result can determine the custody of a child, incarcerate a person guilty of no very serious crime—or release on the public as "cured" someone guilty of repeated brutal rapes.

Presumably, psychological tests do measure something; alas, there's little agreement on what that "something" is, but most experts do think there's an underlying construct. If Rosen had merely accused me of overstating my case, I would plead guilty and refer the reader to the balance of my column in extenuation.

However, Rosen, like many social "scientists," says my views, where they differ from his, are "based either on ignorance, misinformation, or just plain wrongheadedness." It's odd how few social scientists understand that others may know as much as they and yet reach different conclusions. In most scientific professions, differences among scientists can be productive; but they won't be if the scientists insist, as Rosen does, on using high school debate tactics.

Psychological tests—both pencil and paper and the less objective ones such as Rorschach and Draw-a-man—remain useful, but the failure of the theorists, after over half a century of research, to agree on what the tests measure has put them somewhat outside the mainstream. The brutal fact is that the most productive lines of research into human personality—both normal and abnormal—involve electronics and biochemistry
Jerry E. Pournelle, Ph.D.
Former Human Factors Specialist
Writer and omnivorous reader

Power Protected
Dear Editor:

Rick Cook's article in your November 1984 issue, "Power-Line Protection," was one of the best I've ever read. He clarified a confusing topic and made my search for a power-protection device easier, since he pointed out ways to evaluate what I needed.
Darlene Rutherford
Boulder City, NV

Angry Scandinavians
Dear Editor:

We are asking you to stop printing ugly remarks like "hypnotized Scandinavians trapped in oil drums" in Doug Stewart's "Opinion" article in your October 1984 issue (page 27). We don't see the point in ridiculing other nationalities in order to write an article on audio chips.
The WASA ORDER
Scandinavians of Dallas

The Synchro-Energizer
Dear Editor:

Regarding the Advanced Technology column on "The Synchro-Energizer" in your November 1984 issue, there are distinct dangers in rhythmically flashing bright lights in people's eyes. Some people are peculiarly photosensitive, and a critical set of flash rates will produce in them an epileptic seizure. About 2 or 3 percent of epileptic patients are photosensitive, and there are some people who never have had a seizure who may have one, given the appropriate set of flashing lights.

Don't encourage products that may be hazardous to someone's health.
John R. Knott, Ph.D.
Professor Emeritus
(Neurology and Psychiatry)
University of Iowa
Consultant in
Electroencephalography
Quincy, MA

Popular Computing welcomes your feedback regarding articles that appear in this magazine as well as your comments about the personal computing field in general. Write to Letters, *Popular Computing,* POB 397, Hancock, NH 03449. (Due to the number of letters received, we cannot respond individually.)

Credit Due

Due to a printer's error, credit and copyright lines were inadvertently omitted from some of the photographs of winning entries in our Computer Art Competition featured in our November 1984 issue. They are:

Page 75, *Mondo Condo,* and page 76, *Inside a Quark* by Ned Greene: courtesy of New York Institute of Technology, Computer Graphics Laboratory

Page 77, *Eye-Stye* by Susan Wascher: Visible Language Workshop, MIT

Page 81, *Fazes* by Alice Kaprow: Visible Language Workshop, MIT

Page 89, *Inavol* by Hervé Huitric and Monique Nahas: © 1983

We would also like to take this opportunity to express our special thanks to the members of our independent judging panel who labored long and diligently to select the winners in the competition: Barbara Nessim, a New York-based professional artist specializing in computer-generated art whose expertise was especially helpful in assembling the panel; Robin White, director, Media Alliance, Inc.; Marvin Heiferman, curator, corporate art consultant and critic; Barbara London, curatorial assistant of the Video Department, Museum of Modern Art; Cynthia Goodman, research associate for the J. Paul Getty Trust/Guggenheim Museum; Muriel Cooper, director, Visible Language Workshop, MIT; Valerie Smith, curator, Artists' Space; Robert Mallary, professor of art, sculptor, and a long-time instructor of computer-generated art at the University of Massachusetts; and Fred Parke, director of the Computer Graphics Laboratory at the New York Institute of Technology.

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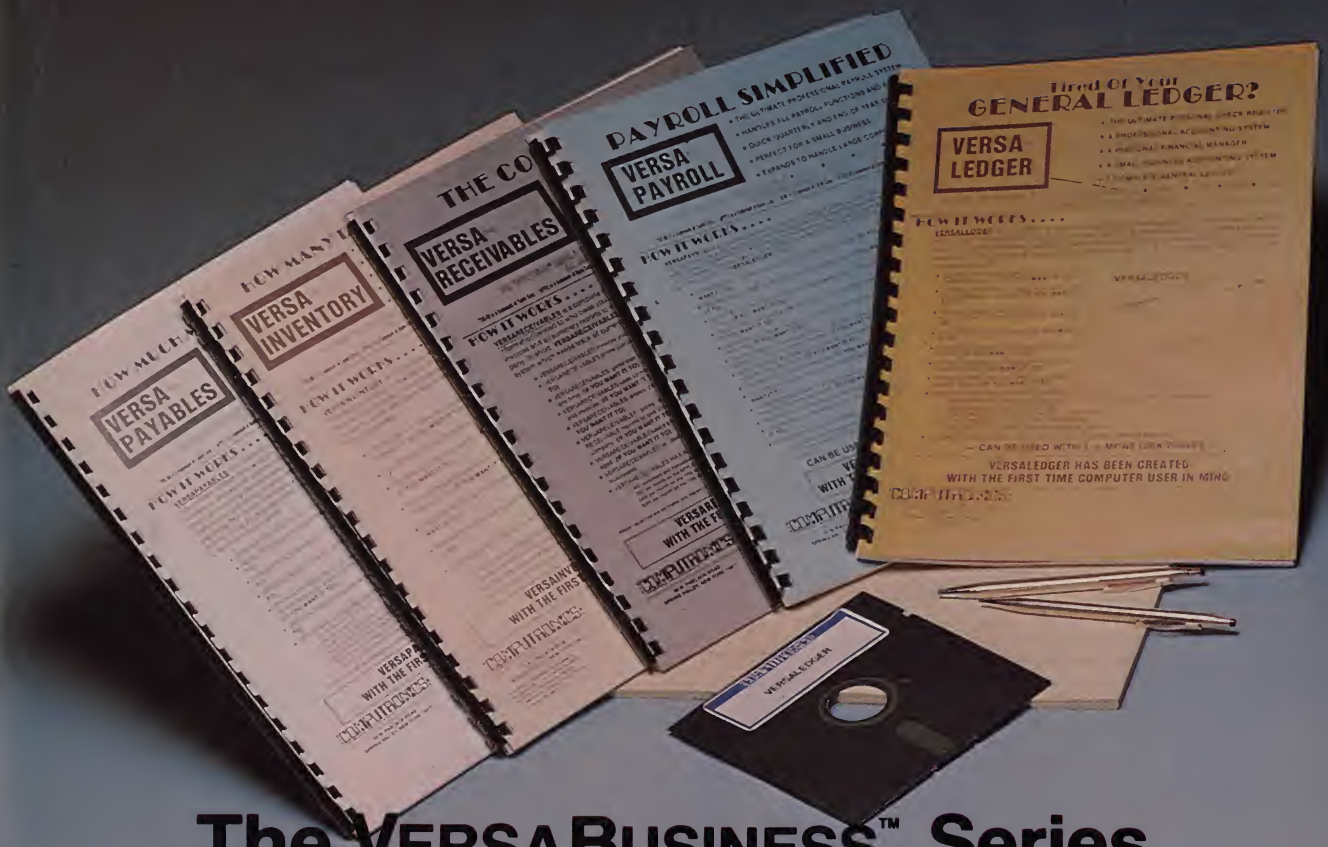

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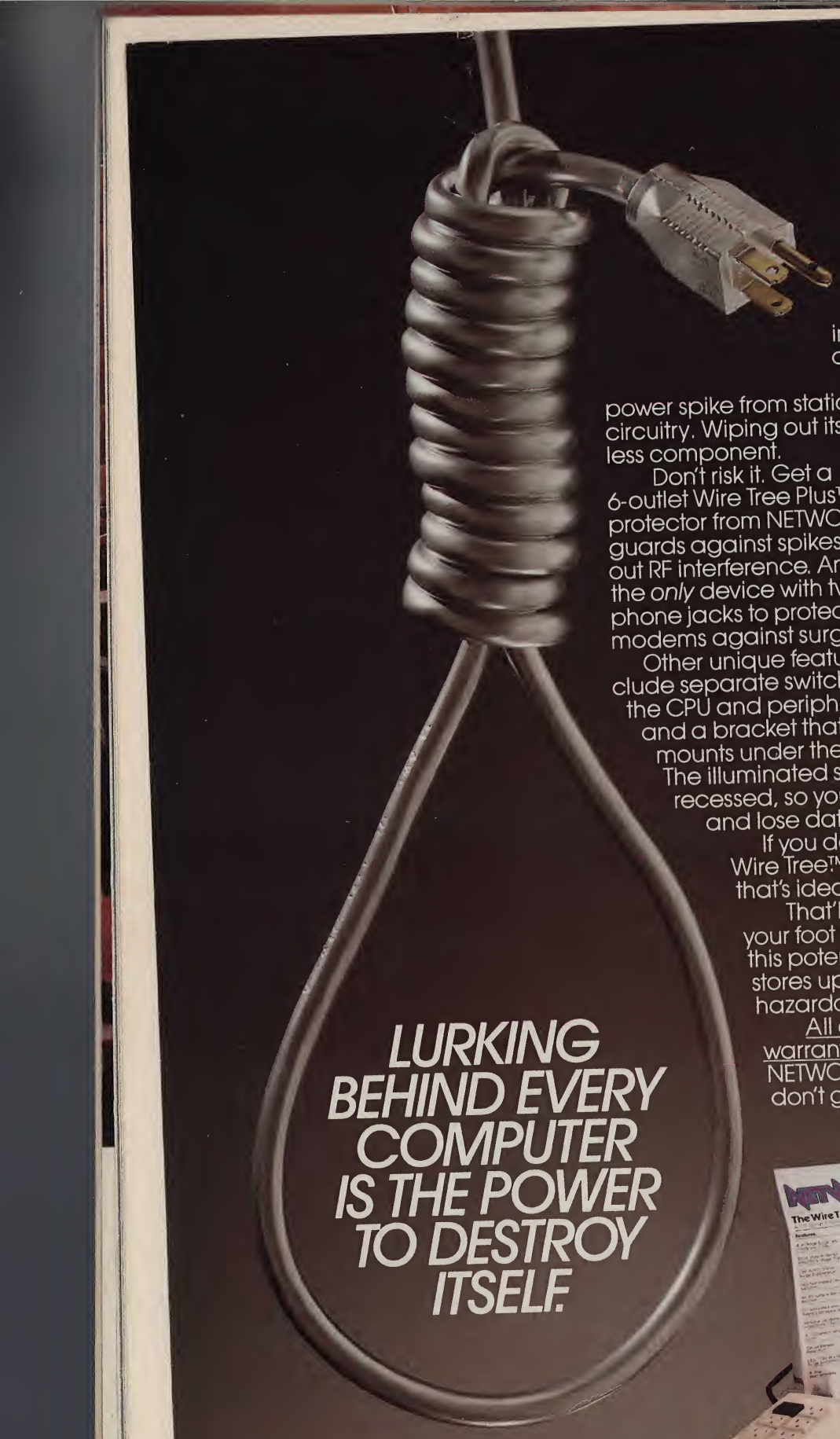

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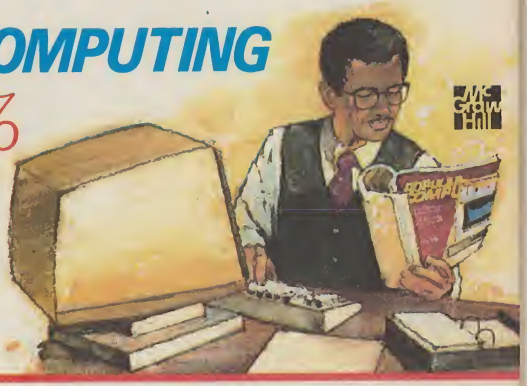

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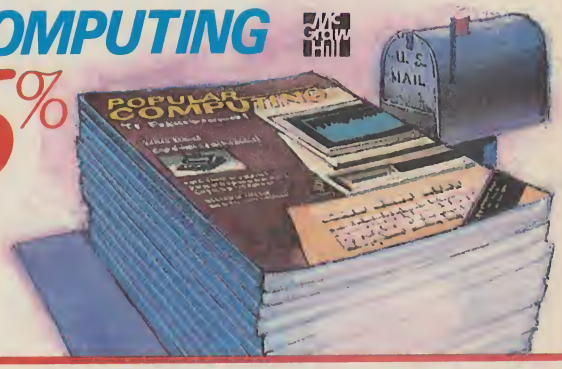

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Portable Computers Continue to Evolve

Over the past several months, one computer manufacturer after another has rolled out a portable computer that it claims comes as close as possible to the ideal. Many of these machines embody significant advances, but no manufacturer has yet shipped a product that truly satisfies those of us who want a full-function computer that's easy to take with you.

The ideal machine would fold everything a desktop computer offers into a small, lightweight package complete with dual disk drives, a full-size display, plenty of internal memory, and battery power. And if it could run the huge library of IBM PC software, so much the better.

In their efforts to meet this demand, computer manufacturers have taken two main approaches. The first of these has given us the computers that look like portable sewing machines. Osborne, Kaypro, and Compaq produce the best-known computers in this class. At 20 to 40 pounds, these machines aren't really that portable. Euphemistically called "transportables" or "luggables," they're essentially desktop computers with handles. Sure, each is a single unit that you can—oof!—carry with you, but you probably don't want to carry one of these machines any farther than you absolutely have to. And because they generally don't run on battery power, you're still tied to an electrical outlet.

Meanwhile, other manufacturers have emphasized portability while conceding some functions, giving us machines like the Epson HX-20, Radio Shack Model 100, NEC 8201, and Olivetti M1. These "laptop" computers are portable, all right—they take up about as much space in your briefcase as a hardcover book, weigh only about 4 pounds each, and run on batteries so you can use them while sitting in a park, on an airplane, or just about anywhere. While they do some things very well—BASIC programming, text editing, and simple telecommunications, for example—they suffer from the limitations of their tiny screens and their inability to run much desktop software.

What we've needed all along is represented by convergence of these two approaches: computers that have the power of desktop machines yet weigh less than the abridged edition of the Oxford English Dictionary. And indeed, manufacturers have been closing the gap between full functionality and easy portability.

On the low end, the $995 Epson Geneva PX-8 offers an 8-line, 80-column display as well as CP/M, Wordstar, and other software on ROM cartridges. For another $1000, the Sharp PC-5000 gives you a 16-bit processor that is similar to the one used in the IBM PC and is MS-DOS compatible. While both of these machines offer optional external disk drives and standard operating systems, they really don't provide that large a software selection. Moreover, an 8-line display doesn't really fill the bill.

At the high end, Grid Systems sells several versions of its portable Compass (at prices from $4250 to over $12,000), which features a very readable electroluminescent display. Though Grid offers an optional disk drive and MS-DOS, it still falls short in terms of software selection. And its battery won't power the machine for long.

All these machines may find profitable niches in the market, but they don't quite meet the ideal. In the past few months, however, several newer machines have come closer, offering battery power, wide software bases, and larger displays while still preserving easy portability.

The highly touted Hewlett-Packard Portable was one of the first machines to integrate most of the advantages of both true portability and full functionality. At 8 pounds, it offers a 16-line display, optional external disk drives, connections to an HP Touchscreen PC or IBM PC, and MS-DOS, Lotus's 1-2-3, simple telecommunications, and text editing in ROM.

The Morrow Pivot and the Osborne 3, both designed by Vadam, feature 16-line displays, MS-DOS, and one or two 5¼-inch disk drives. The machines also run many of the programs written for the IBM PC. The displays won't win any awards, and the machines are not as IBM PC-compatible as the manufacturers have claimed, but they do run many of the programs written for the IBM PC on their original disks. Thus far, they are the only machines that can make this claim.

The first machine in this class to provide a 25-line display is the Data General One. The display has the same proportion of vertical to horizontal size as a desktop computer's, but it is difficult to read. The Data General One will run many more of the programs written for the IBM PC if these programs can be copied to or are made available on 3½-inch microfloppy disks.

Texas Instruments also uses a 25-line display on its Pro-Lite (reviewed on page 117 of this issue). Though it's smaller than the Data General One's display, it's

Photograph: Lee Waldman/The Stock Market

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easier to read. Many people will be disappointed, however, because TI went for compatibility with its own Professional line rather than with the IBM PC.

This list of machines represents only the tip of the iceberg. This spring, ACT will introduce a portable computer with a 25-line display, MS-DOS, a single microfloppy drive, an infrared mouse, and voice recognition capabilities, but the firm does not plan to offer a battery pack. Other entries are forthcoming from Kaypro, Mitsui, and IBM.

All of these machines have plenty to recommend them, but in each case, the manufacturer has had to make some hard choices. Someone in the market for a full-featured portable should look carefully at any machine's display, disk-drive setup, power requirements, and potential for expandability.

The most visible question, of course, is the display technology. Thus far, most truly portable computers use liquid crystal display (LCD) screens, though a few, such as the Grid Compass, use electroluminescent (EL) screens. Neither technology currently allows for color—you'll simply have to accept that as a necessary trade-off for portability.

EL screens look like the amber cathode-ray tube monitors that many people use with desktop computers, and they may be even easier to read. Unfortunately, they are currently more expensive than LCDs, and they require too much power to work well with a battery pack. LCDs are less expensive and draw less power, but they display black characters on a gray background—far from the most readable combination.

Finally, the readability of LCD screens depends a great deal on the angle of light hitting the display. Therefore, machines with displays that tilt, such as the HP Portable or TI Pro-Lite, can adapt better to surrounding light than those with fixed displays, such as the Morrow Pivot or Data General One.

Disk drives present another set of questions. Software in ROM, such as Lotus's 1-2-3 on the HP Portable, is faster and more convenient than software on disks. But machines that come with disk drives are much more flexible in that *you* choose what is stored in the computer.

Manufacturers also have to consider the size of the disk drives. The 3½-inch drives used by Data General, TI, and Hewlett-Packard offer greater storage. But many more programs are available in the 5¼-inch format used by most desktops, and the larger disks make it easier to transfer data.

Power requirements also vary widely, depending on the manufacturer's choice of disk drives, screens, telecommunications, and other options. The more a machine does, the more power it takes, thus limiting its battery life. Currently, you can expect batteries to last from about 5 hours on a fully loaded disk-based machine to nearly 20 hours on the HP Portable.

Finally, manufacturers have to choose how expandable to make their computers. The choices range from the closed HP Portable to the TI Pro-Lite, with its option slots.

None of these machines is perfect for everyone. All are still more expensive, offer less readable screens, and are less expandable than desktop computers or their transportable cousins. But for the time being, they will satisfy many people who need to take their machines with them. And hope for the ideal machine is still high. Data General has said it plans to offer better LCDs or EL displays as they become available. Hewlett-Packard has been looking at larger screens. And I've seen George Morrow scrutinizing schematics of a more compatible portable with a tilting 25-line LCD screen.

In some ways, though, portable computers still have a long way to go to meet the expectations of their designers. Not everyone needs or wants to take a computer along. As a result, many of the current machines have the look of an engineering solution to a problem that may or may not exist. And as often happens in such situations, sales for portable computers have lagged behind predictions.

Another problem is that smaller machines look as if they should cost less than their "big brothers" that sit on desktops—even if the machines are functionally identical. Manufacturers need to convince customers that it simply costs more to build functionality into a smaller machine that uses less power.

All these things should come to pass, and portable computers may yet become as important in the market as their manufacturers have predicted. Yet even if the "ideal" portable appears next year, it won't satisfy everyone. Someone will ask for a machine that costs less than $100 and fits in your coat pocket. Don't laugh—somewhere, someone is probably already working on it. —Michael J. Miller

Manufacturers Agree on Networking Standards

Can any group of computer manufacturers agree on a standard? Apparently (and perhaps surprisingly), the answer is yes.

A number of computer manufacturers, software vendors, and makers of networking hardware announced in November that they would support a common networking standard using Microsoft's MS-DOS 3.1 as well as that firm's redirector and file- and print-sharing software. The announcement mirrors an earlier indication from IBM that it would offer a networking system based on MS-DOS 3.1, Microsoft's redirector, IBM's own file and printer sharer, and PC Adapter hardware provided by Sytek.

The firms promising to support the Microsoft standard include Corona Data Systems, Digital Equipment Corp., Fortune Systems, North Star, Texas Instruments, Hewlett-Packard, Zenith, and Apollo. However, several well-known suppliers of MS-DOS computers—such as AT&T, Columbia, Compaq, NEC, and Tandy—were not on the list.

Perhaps the biggest difference between this announcement and IBM's own network plans is its inclusion of several "independent transport vendors" that will offer hardware supporting the standard. Among these vendors are AST, Corvus, Nestar, Davong, Proteon, Interlan, Ungerman-Bass, and Western Digital. Noticeably absent, however, are Sytek, which supplies the IBM network, and 3Com, which offers Etherseries networking hardware supported by many of the computer manufacturers on the list. □

Observations

Wordstar 2000 Hits the Market

After all these years, Micropro has finally come up with a new word-processing program. Called Wordstar 2000, the new product includes a mnemonic-based user interface, automatic paragraph reformatting, on-screen boldface and underlines, as well as support for a variety of printers (including those offering proportional spacing and multiple fonts). Also impressive are built-in spelling correction and hyphenation, mailing lists, sorting, footnoting, and math features. In addition, Micropro will offer Wordstar 2000 Plus, which adds telecommunications and indexing features. Unlike the original product, the new programs now are copy-protected. Micropro plans to market the original Wordstar as a low-cost word processor (at $250), with Wordstar 2000 (at $495) and 2000 Plus (at $595) aimed at business users. Current Wordstar users can upgrade to Wordstar 2000 for $250 or to 2000 Plus for $300.

A Turbocharger for the IBM PC

Orchid Technologies (of PCnet fame) is now shipping PCturbo-186, a product certain to bring out the technolust in all of us. The plug-in board adds an 80186 microprocessor and up to 640K bytes of RAM to your IBM PC or XT. The 80186 handles applications while the 8088 works with peripherals, increasing the speed of the PC by 200 to 400 percent, according to the company. PCturbo sells for $1095 with 128K bytes of RAM. Orchid also plans to market software that will permit the 80186 to run applications concurrently with the IBM processor (the 8088 in the PC and XT or the 80286 in the AT). The software creates one full-screen window for each application; you switch back and forth with a couple of keystrokes. Called PCturbo Concurrency System, the product will be available early this year.

New Software Aimed at Managers

Two of the more interesting new products we've run across recently claim to support the decision-making process. Each is available initially for the IBM PC only, and each sells for $495, but there the similarity ends. Reflex, from Analytica (Fremont, California), is a database program that also offers a bit of the analytical capabilities usually found only in spreadsheets or integrated packages. A first glance indicates that it will be very easy to use—you select from pull-down menus to flick between a number of analytical views of the data as well as between detailed and summary reports. The company claims that, by January's introduction, you will be able to draw a line chart and the program will enter corresponding data into the file for you—possibly the first program with that capability. Lightyear, a program from a Santa Clara company of the same name, folds "what-if" modeling into the decision-making process. You type in choices; come up with a list of factors that will influence your decision; weight each factor using a numerical, textual, or graphic scale; add your own rules; and describe each choice using your list of factors. The program displays the results in bar-graph form. You can then fiddle with the factors to alter the results.

Appliances Take Control

Microprocessors are beginning to show up in the strangest places. Take the Speaking Scale with Memory, for example. When you step on the scale, it announces your weight and tells you how much you've gained or lost. Not only that, the clever scale can track the weights of five people and verbally warns you when its battery is running low. All this is yours for $125, thanks to the folks at Davidcraft, in Lincolnwood, Illinois. You say you don't want your bathroom scale to talk to you? Well, how about a microprocessor-controlled toaster? The $45 Microchip toaster, from Williams-Sonoma in San Francisco, promises perfectly toasted bread every time. When you pick a setting for a particular type of bread, the machine counts the pulses of electricity that enter the toaster. Once this reading is stored in its memory, the toaster then outputs each consecutive slice of bread in exactly the same shade of toastiness. Bet your IBM PC can't do that!

Do I Hear $220?

Remember Intuit, the integrated software package whose $50 introductory price was going to rise by $20 a week until...? Well, it got up to $210 before the folks at Noumenon Corp. (Alameda, California) called a stop to the promotion and settled on a final price of $89.95. Company spokesman Mike Mead says those who paid more will get coupons for add-on enhancements. A $20 bookkeeping module is the only enhancement currently available, but Mead, who calls Intuit the Chevy pick-up of software packages, says that communications and graphics add-ons will follow shortly. The company shipped more than 1500 packages during the six-week promotion.

T-shirt Compatibility for the Mac

Like your Macintosh so much you want to wear it? Well, Diversions Inc. of Belmont, California, now offers the next best thing. With its Underware (could we make that up?) printer accessory kit, you can take any image from MacPaint and create an iron-on transfer for T-shirts or other cotton/polyester fabrics. The kit features a special print ribbon along with instructions on how to use MacPaint's horizontal flip feature to make sure your image irons on correctly.

Calendar

National Shows and Conferences

Office Automation Conference
February 4–6, Georgia World Congress Center, Atlanta
Focusing on "Today's Partnership: People and Technology," this conference includes exhibits from more than 150 companies as well as seminars for professionals and executives. Seminars emphasize practical approaches to increasing productivity and cover topics such as the impact of automation on organizations, communications technologies, and networking.
Cost: Exhibits only: $50; conference and exhibits: $50 for 1 day, $125 for 3 days. OAC '85, AFIPS, 1899 Preston White Dr., Reston, VA 22091; (703) 620-8952.

Personal Computers—Now in Business
February 10–13, Infomart, Dallas, TX
This program is the first in a series sponsored by *Inc.* magazine and Infomart for professionals, owners, and managers of small and medium-sized businesses. The program features exhibits of microcomputers, software, and services and sessions on evaluating software packages, compatibility, and local networks.
Cost: Exhibits only: $25; conference and exhibits: $125 for 1 day, $195 for 4 days. Infomart Index Series Office, 1950 Stemmons Freeway, Dallas, TX 75207; (214) 655-6208.

Regional Shows

The Commodore Show
February 9–10, Cathedral Hill Hotel, San Francisco
Cost: $7.50 for 1 day, $12.50 for 2 days. West Coast Commodore Association, POB 210310, San Francisco, CA 94121; (415) 982-1040.

Rainbowfest
February 15–17, Irvine Marriott, Irvine, CA
Cost: $7 for 1 day, $9 for 3 days; for owners of Radio Shack TRS-80 Color Computers. Falsoft Inc., POB 385, Prospect, KY 40059; (502) 228-4492.

Texas Computer Education Association Fifth Annual Conference
February 13–16, Hyatt Regency Hotel, Austin, TX
Cost: $20 in advance; $25 on site. TCEA Conference, POB 2573, Austin, TX 78768.

Special Interest

Association of Teacher Educators National Convention/Microcomputers and Media Exhibit and Show
February 18–19, Riviera Hotel, Las Vegas, NV
For elementary, secondary, and higher-education teachers, researchers, and administrators, the ATE conference addresses the theme "Preparing Teachers for Tomorrow." Held in conjunction with the convention, the show features exhibits, demonstrations, and workshops on microcomputers and communications technologies. The exhibit and show are open to the public.
Cost: Exhibits only: $5 or less; conference: $65 members, $80 nonmembers. Executive Director, ATE, Suite ATE, 1900 Association Dr., Reston, VA 22091; (703) 620-3110.

Mini/Micro West 85
February 5–7, Anaheim Hilton Hotel, Anaheim, CA
For electronics professionals, this exhibit and conference emphasizes current trends, advances, and applications in many areas of electronics.
Cost: $10. Electronic Conventions Management, 8110 Airport Blvd., Los Angeles, CA 90045; (213) 772-2965.

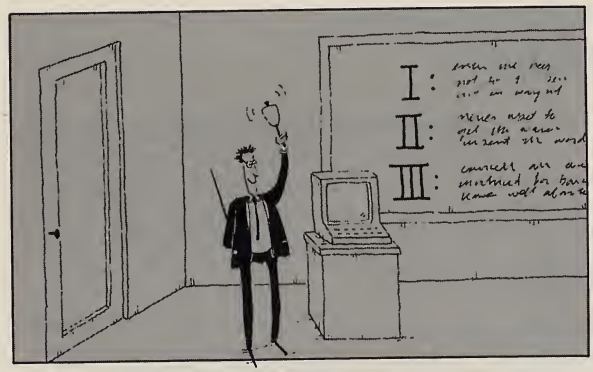
The Role of the Computer in Education
February 20–22, Arlington Park Hilton, Arlington Heights, IL
For teachers of all grade levels, this conference presents daylong workshops and shorter sessions on topics such as problem solving with Pascal, MacPascal, Logo, and interactive videodiscs.
Cost: $60 for 2 days (nonmember fee); $100 for daylong workshops (February 20). Rick Nelson, Micro-Ideas, 2701 Central Rd., Glenview, IL 60025; (312) 998-5065.

Classes and Seminars

Computer Competence Seminars
Boston University Metropolitan College, University Seminar Center, Suite 415, 850 Boylston St., Chestnut Hill, MA 02167; (617) 738-5020
Courses include Computers for Managers; Multiplan, Visicalc, and Other Spreadsheet Programs; Using dBASE II to Manage and Process Information; Wordstar; Getting Started with Lotus 1-2-3; BASIC for Managers; Personal Computers for Improving Financial Analysis and Decision Support; and The Complete Beginner's Guide to Software Selection.

Datapro Research Corporation
Educational Services, 1805 Underwood Blvd., Delran, NJ 08075; (800) 257-9406 or (609) 764-0100 in NJ
For managers and professionals, an extensive nationwide series of seminars covers microcomputers, data communications, telecommunications, management development, office automation, and other areas.

Personal Computer Learning Centers of America
1120 Avenue of the Americas, New York, NY 10036; (212) 840-6873
Introductory and advanced classes in word-processing, database-management, and spreadsheet programs, in New York City, White Plains, NY, and Philadelphia.



IBM Supports Teacher Training

While IBM was busily cornering the business market with its PC, XT, and AT, the little PCjr was sitting quietly on the sidelines like a forgotten stepchild.

At least that's how it might have appeared after the machine met with a flood of bad reviews, primarily due to its keyboard. IBM fixed that problem, but the little machine still didn't seem to have a secure place in the IBM family—until now.

At a recent press conference in Palo Alto, California, officials from Big Blue revealed that the company had been working for almost a year with a new organization in Fremont, California, called the National Computer Training Institute (NCTI).

NCTI offers a 45-hour, $195 course to train primary and secondary school teachers to use computers. With 90 locations around the country as of November and plans for 200 by the end of 1985, it is the first such project of its kind, according to NCTI officials.

Each of NCTI's training locations will house 15 PCjrs with 256K bytes of random-access memory, color monitors, and graphics printers—all on loan from IBM. The centers will also have a full range of software, including Writing Assistant, Multiplan, Logo, Turbo Pascal, and such goodies as Turtle Power, Adventures of Math, and Bumble Games, says NCTI president Bruce Fredrickson.

In addition to loaning the hardware and donating some of the software, IBM has supplied unspecified financial backing to the project. All this makes it clear that IBM has hopes of unseating Apple as the dominant supplier of computers to schools. (Currently an estimated 50 percent of computers in schools are Apples.) Fredrickson confesses that when he first came up with the idea for NCTI, he approached Apple for support but found none. IBM—generally considered to have no more than an 8 percent share of the education market—saw NCTI as a wedge.

"The battle for the education market is far from over," said Robert E. Wallace, IBM's manager of industry marketing, in explaining why his company supported NCTI.

"We have seen figures that suggest that for every child to be able to use a computer in school for 20 minutes a day, the schools will need at least 4 million computers. And we don't even know whether 20 minutes a day is enough," says Wallace.

The NCTI project complements IBM's earlier announcement that it would offer teachers the IBM PCjr with color monitor for $950—a $550 discount.

For his part, NCTI's Fredrickson claims total independence from IBM and its marketing goals.

"My business is training teachers to use computers," he said. "The training can be applied to any computer, not just an IBM." Nonetheless, he says he has no plans to use anything but IBM machines in the foreseeable future.

—Jonathan Sacks

A GEM from DRI?

Still another entry in the complicated operating environments field has surfaced, but this time around, Digital Research may have come up with a winner. Its GEM (Graphics Environment Manager) brings a standard graphics user interface to any computer running under MS-DOS or the firm's Concurrent DOS in DOS mode.

The GEM environment allows for overlapping windows, use of a mouse, pull-down menus, icons, and data transfer among programs. In other words, it works a lot like Apple's Macintosh user interface. In fact, GEM Desktop, DRI's first GEM software application, looks a lot like the screen display that the Mac made famous.

In addition, GEM supports the graphics standard recently endorsed by IBM, so it can use a variety of graphics devices that the Mac doesn't yet support. You still have the familiar A> prompt and traditional file directories if you want, and any MS-DOS applications program can run under the GEM Desktop.

Unfortunately, however, you can't buy GEM or GEM Desktop—the products are available only bundled with hardware or with other software products. Digital Research will bundle both GEM and the Desktop with three presentation graphics programs scheduled for release in early 1985—GEM Draw, GEM Wordchart, and GEM Graph. And naturally, the firm hopes other software vendors will bundle GEM with their software. DRI is offering an inexpensive toolkit for developing such programs.

GEM will compete with IBM's Topview and Microsoft Windows. Topview will be a multitasking environment running only on IBM PCs with large amounts of memory. GEM, which runs only one application at a time, can work on smaller computers, including the PCjr.

In the meantime, Microsoft has rescheduled its Windows environment again, now saying it hopes to release the product in June. Microsoft said it delayed the already-late product to make it work faster and run on a machine with 256K bytes of memory. In the long run, the success of Windows, Topview, and GEM will depend upon the support they gather from independent software vendors.

—Michael J. Miller

Illustration by Mark Kseniak

Five Fallacies of Home Computing

Although microcomputers have become essential to small-business operations, they are often a disappointment at home. Many of my friends who have bought computers strictly for home use regard their machines with a mixture of pride and guilt, much the same way they might treat a health club membership, a collection of the Hundred Great Books, or their certificate from an EST seminar. It's something expensive and worthwhile that somehow they have never taken advantage of.

The reason for this is that we learn about computers from advertisements and magazines that perpetuate what I like to call the Five Fallacies of Home Computing.

• **Fallacy #1:**
Kids love computers.

The computer is a wonderful educational tool, but don't buy one for this purpose! Time and again I've seen concerned middle-class parents buy a computer plus excellent educational software and watched their delight as the child plinks away. . . for a few weeks. Then I've witnessed their disappointment as the child gradually loses interest and drifts back to TV or the playground.

Kids don't love computers—they love toys. Without game software, a computer is not a toy. And because kids don't read computer literature, they (unlike their parents) don't believe:

• **Fallacy #2:**
Education is fun.

Sometimes it's fun. Every child has at least a few fascinating interests and a few good teachers who help make learning fun. But in the end, education requires a certain amount of tedium, drill, and practice.

No sensible parent would lay down $1000 for a piano, sit Junior down at the keys, and walk away. Except in the case of the rare prodigy, this is not enough. To instill a love of music, the parent must spend a great deal of time entertaining the child, playing the piano for him or her, going to concerts, cajoling, nagging, exhorting, and otherwise communicating enthusiasm and encouragement.

No one would argue with this, but sticking a child in front of a computer is no different. A parent must be just as intensely involved if the child is to benefit.

• **Fallacy #3:**
A computer will organize your life.

Recently I reviewed a home accounting program. When you enter your income, expenses, checks, bills, credit-card purchases, interest and dividend statements, and so forth, your entire financial life becomes clear as crystal. A few keystrokes will call up the month's budget, balance your checkbook, analyze your stock portfolio, generate a list of tax-deductible expenses, and print your checks.

Because my finances are not simple, I might use this sort of program. In addition to my freelance income, I have a part-time salaried job at a university and a one-man medical business. I have three checking accounts, two savings accounts, an IRA, and sundry insurance policies, credit cards, and business expenses. But I'm well organized—I have no trouble balancing my checkbooks or paying bills on time. I doubt if I spend an hour a month keeping things straight.

My wife, who runs a small business, is another story. She often puts off balancing her checkbook to the point that it requires an afternoon of agony. Bills, receipts, and even incoming checks are thrown in a pile, and some lost forever.

At the beginning of every new year, I start in on a three-month campaign of coaxing, wheedling, pleading, abuse, and threats that lead inevitably to a frantic weekend yielding a page of tax data.

Which of us would benefit from a home accounting program? Me, of course. An obsessive type, I'd have no trouble sitting at the computer to enter the necessary updates. My wife would never do that. The moral is that if you're already organized, a home computer will make you more so. If you're not organized to begin with, a computer will no more organize your accounts than a library card will make you literate.

• **Fallacy #4:**
A computer will save you money.

Nonsense—it will cost you plenty. But that's OK; it's like my recent purchase of a $900 washer and dryer after five years of hoofing it to the laundromat. Even with the most liberal cost analysis, this purchase is a loser. But I love it.

• **Fallacy #5:**
A computer will save you drudgery.

Sometimes, but if used properly, it also requires a lot of drudgery. Take, for example, the superb database program that houses my journal articles. It's far superior to a simple file cabinet because I can classify articles under a dozen different headings and retrieve them with a couple of keystrokes. But it required about 50 hours of unrelieved, boring data entry to reach this state of grace.

So home computers are not likely to save you any appreciable time or money. A computer by itself offers no magic that will educate your children or organize your life, although it can help you accomplish these goals if you invest time and effort. But one claim about home computers is not a fallacy—the machines are lots of fun.

—Michael Oppenheim

Michael Oppenheim is a physician and freelance writer living in Los Angeles.

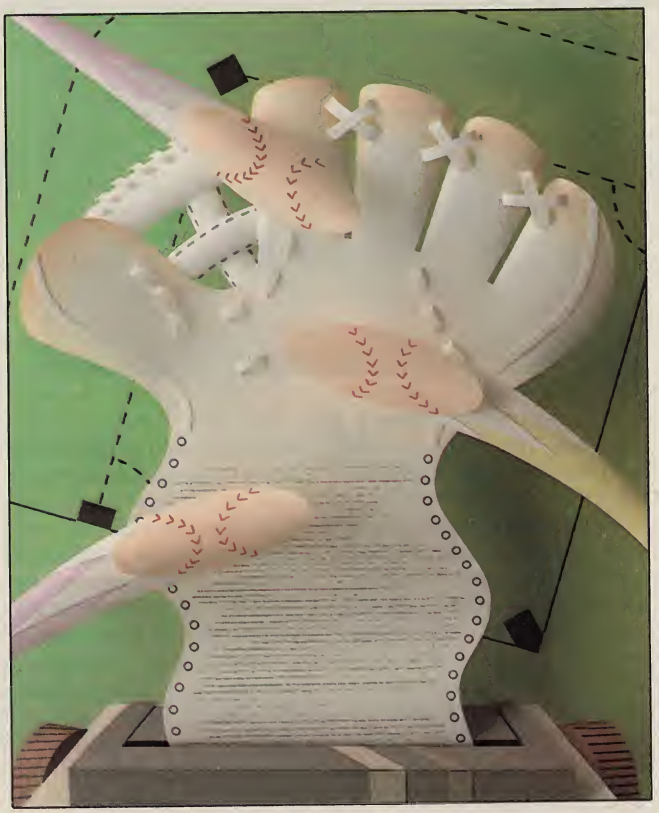
Illustration by John O'Leary

Computer Moonlighting

Beware the temptations of a subtle seductress

by Steven Levy

The personal computer is a strange seductress. She beckons subtly, and some people do not realize until it is too late that their resistance has evaporated. Before they know it, they have created something that seems important enough for the world to share. And it often turns out that other people can benefit from these creations so much that they might well pay real money to get those benefits. The act of computing is so pleasurable that the step from creating to selling might seem painless. But it never is so. Even those talented and lucky few who have made fortunes from their computer artistry look back with longing at the blissful days they spent *creating*. It was paradise compared to the stressful task of selling and servicing.



A Writer's Story

Phillip Rosenberg held a doctorate in literature and had written several books but made his living as a television writer. He lived on the Upper West Side of New York City, in a co-op apartment that many would kill for, with his wife, Charlotte, and two young sons —and no computers.

It was a fine existence, and in years past Phillip Rosenberg would never even have thought of owning a computer. But it was 1981 and his curiosity was piqued about the microcomputer revolution and what it might do for him. He was writing his scripts on an IBM electronic typewriter, and its features gave him a glimpse of the future. One day, he thought, he'd get one of those micros and do word processing on it.

That day came quicker than he expected. There was a sudden opening for a head writer on a television series called *Nurse*. The life of a television writer is one of feast or famine, and this was obviously a feast of a job. But as soon as the producer revealed the good news that Phillip was hired, he followed up with the bad news.

"We start shooting the next episode Monday," said the producer.

It was Wednesday night. "I have four days, then, to write a script," said Phillip.

"No, you have two days," said the producer. "Production needs the script by Saturday."

At nine o'clock the next morning, Phillip Rosenberg went to the computer store, and at ten-thirty he was back in the co-op apartment that many would kill for with an Apple II Plus, a CP/M card, a high-speed Diablo printer, and a copy of Wordstar. He mastered the program quickly because he had no choice. He thought that it was the only program he would have to learn on the Apple because, after all, he bought the machine only to write scripts.

He made his deadline and began working on the next script immediately. For the next 13 weeks, many more scripts for

Sculpture by Ajin; Photograph by Hero Ihara

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Nurse went through Phillip's computer, were printed on his printer, acted by professionals (the title role was played by Michael Learned, known to many as "Ma Walton"), and viewed by millions of Americans.

Alas, the show, though critically praised, was watched by several million fewer Americans than the network had hoped, and *Nurse* was terminated. But Phillip Rosenberg had done well, earning the kind of money that television writers earn. He deserved a rest and could afford it.

Rotisserie League Baseball

Now, one of Phillip Rosenberg's prime diversions was participating in a special kind of baseball league. Not a physical activity, this league was kind of a mental exercise in predicting how well real-life baseball players would perform in the upcoming season. Each of 12 team "owners" in the league would assemble an imaginary squad of major leaguers, chosen at an auction before the season started, and then the statistics compiled by those real-life baseball players would accrue to the imaginary teams, such as the one collected by Phillip. Each owner put money in a pool, and the team whose players compiled the mightiest set of statistics could win a couple thousand dollars.

It was a scheme cooked up by some baseball lovers in a New York restaurant called the Rotisserie and thereby was called Rotisserie League baseball. There were several such leagues in operation; the owners, who included authors, college professors, lawyers, doctors, and this columnist, followed the fortunes of "their" players with enthusiasm all out of proportion to the sum of money at stake. They got up early in the morning to get the daily box scores (some accessed the scores via Compuserve), they talked on the phone for hours to negotiate crafty trades with fellow owners—some went as far as to buddy up with the general managers of real-life baseball teams to have inside tracks on the fortunes of up-and-coming relief pitchers. The appeal of the league was in the competition, true, but everyone appreciated the beauty of baseball stats and scrutinized them with fanatical intensity.

A problem with the league, though, was the difficulty in compiling the statistics for the imaginary teams. Since each team consisted of players from different real-life teams, and trades and injuries complicated matters, the stats were painstakingly done by hand.

Rosenberg's program totaled the stats for each team in the league, compiled standings, and completely updated the individual performance of every player.

Computerizing the Stats

Phillip Rosenberg, at leisure after his *Nurse* stint, happened to glance at his Apple and realized that it was the perfect vehicle for automating Rotisserie League statistics. Why not take a week and write a program to run the league's stats?

Phillip did not know how to program, but he was game to learn. He spent time with the BASIC manual, finally putting it aside and jumping right into the coding process. It was not so easy. All sorts of subroutines and tricks were required to account for the movement of players from team to team. But it was an exhilarating experience. The deeper he went into the process, the more fascinated he became, encountering problems and solving them. The program grew and grew—eventually the listing would take up 63 pages—and the week-long project wound up taking most of the 1981 baseball season.

Charlotte Rosenberg would tell Phillip that dinner was on the table, and Phillip would be in front of the computer wondering why, when he tried to print out statistics alphabetized by players' names, the printer would print out the name of pitcher Doc Ellis over and over again. So he would skip dinner and figure out what it was about Doc Ellis that did it. And when he found the reason, absolutely high from the triumph, he would call Charlotte over to tell her of his victory. Charlotte seemed not to appreciate the grandeur of it all.

But the program *was* a triumph. After receiving the raw numbers of what each player had done in the previous week, the program would calculate instantly which Rotisserie League team got the benefit of the stats; it would also total up each statistical category (earned-run average, batting average, home runs, etc.) for each team in the league. Then it would compile standings for the league by category and figure out total standings. And it would come up with a printout that completely updated, player by player, the individual performances that made up the total stats of each squad.

It was a true breakthrough, a sterling example of what the computer could do to make life easier, and when Phillip Rosenberg told his league about it, everyone agreed to pay him the fee they had been paying to the person who had done things by hand, slowly, to do the stats. It was not the money that mattered to Phillip, because, if truth be known, he took great pleasure from the job, which he easily worked in with his television writing. During the 1982 and 1983 baseball seasons, he would lovingly tinker with the program. Though he was the only person who used it, he took great care in the physical presentation of the menus. He added all sorts of frills, cleaning up here and speeding up there. By the end of the 1983 season, he had worked out a fast way to input statistics so that the standings could be updated daily; he refigured the stats each day in that

Steven Levy is a contributing editor of *Popular Computing*.

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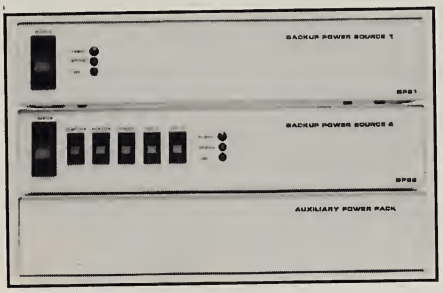

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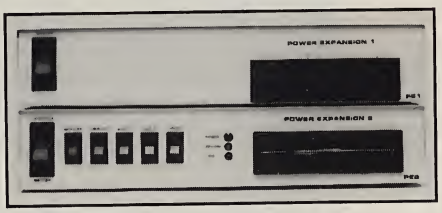

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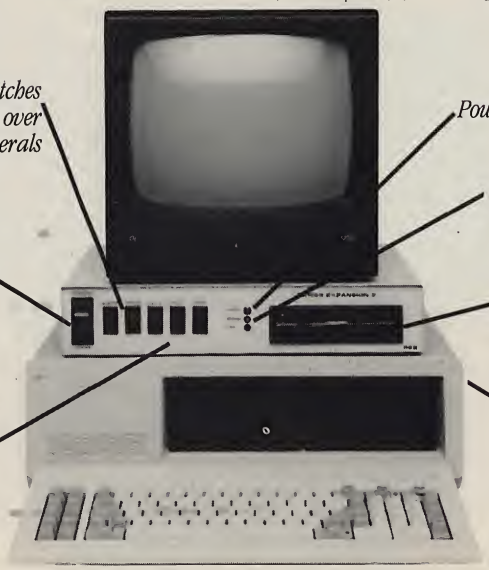

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Rotisserie pennant race.

Everyone in Phillip's league was delighted with the speed, accuracy, and clarity of his statistics. The situation seemed ideal. But after the 1983 baseball season, something happened that greatly changed the nature of Phillip Rosenberg's involvement in this casual computer moonlighting job.

Expansion Leagues

Though Phillip was doing stats just for his own 12-team league, he had always thought that it would be easy to expand the program to do more leagues, and he had talked to the other Rotisserie Leagues operating in New York City about that possibility. It turned out, though, that an editor in one of those other leagues had packaged a book about the phenomenon of Rotisserie League baseball, and his publishing house, Bantam, was releasing the book in time for the 1984 season. The editor suggested an arrangement whereby people setting up new Rotisserie Leagues in various parts of the country would contact Phillip to do statistics.

This was a dilemma. Phillip was, after all, a writer, not a statistics bureau. He could always sell the program itself, but he did not know much about software marketing. So why not just add other leagues to the one he was doing? He figured that since he was inputting the statistics anyway, he could have a separate disk for each league, and the computer would take the statistics of, say, Boston Red Sox slugger Jim Rice and apply them to the individual Rotisserie League teams that "owned" Jim Rice. It would simply require more disk swapping, more printing time, and more answering the phone to take down the player transactions between teams.

So he agreed, and by the start of the season, 25 leagues had signed up with Phillip to do the statistics. Twenty-five times the money he had been getting previously seems like a lot, but to a television writer working at Writer's Guild rates, it was no comparison to script writing. And Phillip was concerned about the impact on his real work. He had been talking to a Canadian television producer about a big new series to run simultaneously in the U.S. and Canada, but the timing on that was vague. So he had plenty of time to set up the leagues and take the transactions over the phone during the first part of the season.

By the 1984 season, Rosenberg had to do the stats for 25 leagues of 10 or 12 franchises apiece and handle calls from 370 would-be George Steinbrenners making deals with each other for newly promoted rookies.

It was soon apparent that this little sideline business was taking up more energy than Phillip Rosenberg thought it would. Inputting statistics was a constant: he and Charlotte would sit in his comfy book-lined office, and she would read him the stats, player by player, while he keyed them into the Apple. Then he would run the program, putting in the disks and taking them out when the computer gave the keys he had so carefully put into the program. But now that there were many leagues, there was an incredible amount of disk swapping. You couldn't really go out or anything, because every five minutes or so the computer would be ready for a disk swap, and if you missed it, the computer would be idle, waiting for the swap, and the process would take that much longer. As it was, half of Monday and all of Thursday was being consumed by this combination hobby and business.

And there were all those phone calls. Twenty-five leagues of 10 or 12 franchises (some with multiple owners) means not only over 370 large letters to stuff, stamp, and mail, but 370 would-be George Steinbrenners making deals with each other, picking up newly promoted rookies, and all too often calling Phillip Rosenberg to get early reports on who came first. There was a pleasant aspect to this—Phillip would become friendly with people in various parts of the country from these frequent conversations—but it consumed a lot of time. Since Phillip was now doing some more script work, it was time he could barely afford. Worse, while the computer was calculating stats and printing them out, it was unavailable for writing. It was becoming clear that perhaps this scheme was not as ideal as it had once seemed.

Feeling the Heat

Then came the call from the Canadian producer. The show was ready to roll. A police drama called *Night Heat*, it would run on Canadian television and CBS in an unusual 11:30 p.m. time slot. As head writer, Phillip would not only turn out scripts but supervise other writers and take the scripts through the production process. He would have to be on-site immediately and the site was Toronto, Canada. So, in August, just as 370 or so Rotisserie League owners prepared to hunker down and study the biweekly stat reports that determined the pennant races in each league, Phillip Rosenberg had to leave his Apple computer and go to work in Toronto.

Because his departure was so sudden, he had no time to execute his contingency plan—show some high school whiz kid the ropes and have him do the stats while Phillip was out of town. He flirted with the idea of bringing his Apple to Toronto with him, but he had no idea whether he would have instant access to *USA Today*, with its detailed player stats. And he would be working long, long days on the show.

There seemed only one solution: let Charlotte Rosenberg do it. She had been reading the player perfor-

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Inquiry 66

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mance data to him every week as he put it into the Apple. And while she had never actually run the program itself to determine league stats, Phillip could prepare detailed instructions. So that's what he did—he wrote an excruciatingly clear eight-page manual to enable his wife to run the program instantly.

The timing was less than ideal for Charlotte Rosenberg. She worked for the co-op board and had meetings to attend and papers to prepare. She also had to maintain a household in the absence of her husband. There were parents' meetings at the school, there was shopping and meals. And as it happened, Phillip's father was in the hospital. The last thing Charlotte needed was a new job.

Even though Phillip's instructions were clear, Charlotte encountered some problems. It turned out that the program requested both first and last names of the players, and many teams would report transactions giving only last names of the players. So she had to distinguish between Steve and Dave Henderson. And that new pitcher for the Brewers, was it Jack Lozorko? Or was that the new third baseman for the Brewers, someone named Lozado? And the name had to be spelled *correctly* or it wouldn't work. Everything almost went to hell because of the way that Lary Sorensen spells his first name. All this adjusting had to be done between literally hundreds of phone calls reporting waiver claims, roster adjustments, and trades.

More than one owner got a desperate phone call from Charlotte Rosenberg that week, wanting to know this or that detail. There was some discussion among owners about whether the stats would appear at all, considering the dire situation in that Upper West Side co-op that many would kill for. But miracle of miracles, Charlotte Rosenberg, at great personal cost, performed well at a job she never asked for.

Return to Paradise

The stats went out, and Phillip did manage to slip back for a weekend to do the final standings. But one thing became perfectly clear. This would be the last year that Phillip Rosenberg maintained a computer business in his home.

When Phillip finishes his *Night Heat* stint in Toronto, he will implement a few ideas he has to jazz up his statistics program. But next year, someone else will take full responsibility for actually running the program and dealing with the leagues. Phillip will be more an adviser than a workhorse. He will have time to play with the computer, time to write scripts, and maybe even time to catch a Yankee game with his sons. The television writer has learned his lesson. □

Editor's Note: Steven Levy welcomes your comments and suggestions. You can contact him on The Source (ID TCT670) or Compuserve (ID 72065,635) or by writing care of *Popular Computing*, POB 397, Hancock, NH 03449.

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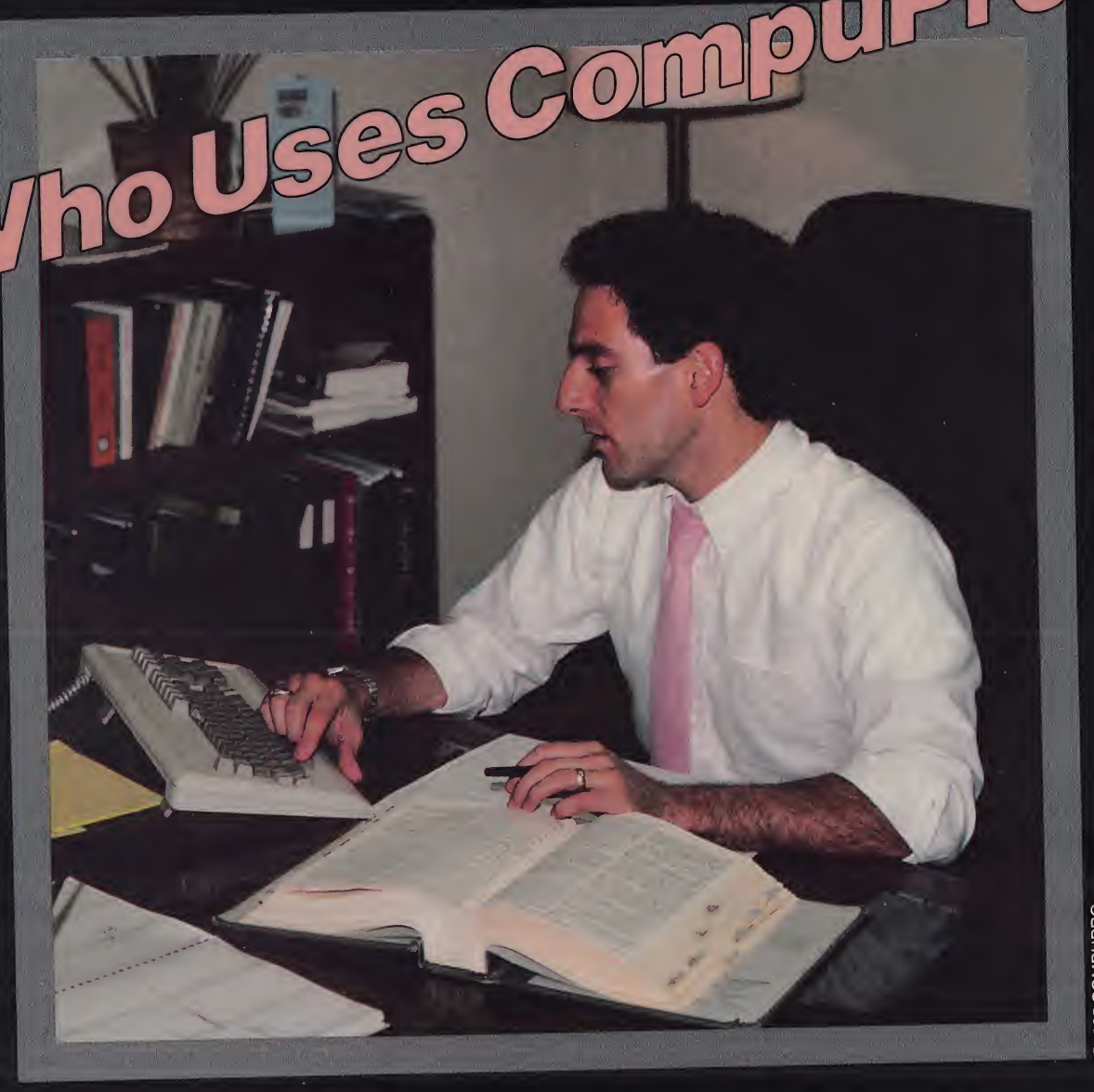

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Why Do They Buy?

Market researchers look for the impulses behind business-computer purchases

by A. Richard Immel

Forecasting the future is easy—the real challenge is forecasting the future *correctly*. Nobody does it very well, and those who look at the future of the computer industry are no exception.

Last year was a particularly rough one for the forecasters. Why didn't anyone tell us, for example, that software sales were going soft? Or that lap computers, multiuser systems, and office networks would still be struggling out of the starting blocks? Even IBM took its lumps with the PCjr, sales of which fell out of bed before the little guy even woke up.

What's going on? What do business people really want in a microcomputer? Do they even *know* what they want?

Tony Wolff, a 38-year-old California market researcher, is one person who's going after answers to these questions in an unusual way. From a small set of offices in the lush wine country an hour's drive north of San Francisco, Wolff runs a Santa Rosa company that has been doing market research for a number of the top electronics and computer companies. Recently he's come up with a new version of an old idea that he thinks offers some clues to why the traditional market-research statistics aren't working.

Wolff's idea is to put some flesh and blood into the predictions by interviewing groups of business computer users, thereby getting a better—and sometimes wholly different—slant on what the forecasts say. One of his early findings, for example, is that while business buyers will give all the "correct" objective reasons for wanting to buy a computer system, when it gets right down to it, they fall victim to the same whims and emotions most other consumers do.

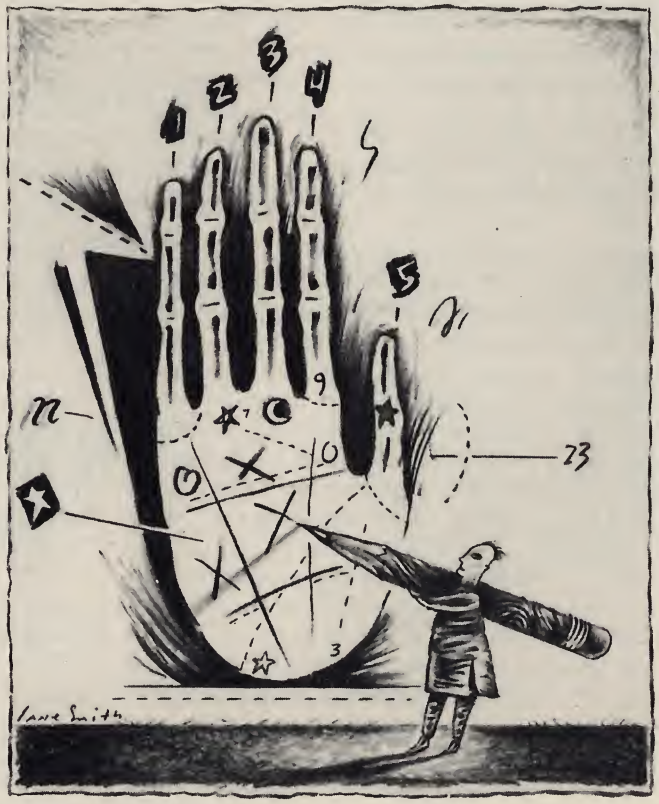

Illustration by Lane Smith

On Camera

Wolff has joined forces with Infocorp, a respected Cupertino, California, research firm of the number-crunching persuasion, and employed the immediacy of television to present what he refers to as "the faces behind the numbers." He calls his nontraditional market-research product ConsumerVision.

Born of a chance meeting on the ski slopes at Lake Tahoe between Wolff and Infocorp president Rich Matlack, ConsumerVision distills 16 or 17 hours of videotaped sessions with consumer groups in various parts of the country into an hour-long videocassette package. Analysis and commentary by Wolff provide continuity and polish to the presentation.

Marty Veselich, who used to film Alan Funt's *Candid Camera* shows, is ConsumerVision's producer. But there are no hidden cameras and talking mailboxes—ConsumerVision doesn't try to catch its subjects off guard. Com-

puter buyers for small and large businesses, management-information-system (MIS) directors, retailers, and consultants are told in no uncertain terms that this is their chance to voice personal messages to computer manufacturers.

Six topics have been scheduled for the first year, all of them hot stuff with manufacturers and consumers alike. ConsumerVision will cover mobile computers (the battery-operated 10-pounders), the multiuser environment and office networking, the IBM presence, service and support, office automation, and the changing nature of the business-computer shopper. The series is being syndicated and sold by Infocorp at $30,000 for the lot. Infocorp already has about 20 takers for the series, most of them major manufacturers like Apple, IBM, Compaq, TI, AT&T, and Burroughs.

The first two sessions—lap computers and multiuser office systems—reveal that potential buyers aren't in love with technology and that companies intent on peddling features instead of solutions are going to have problems. This should not be startling information, of course. Any manufacturer could easily find this out through its own market research, and many have. On the other hand, all you have to do is look at the products on the market to deduce that these lessons don't seem to have sunk in very well.

Initial responses from ConsumerVision clients have been generally, but not entirely, favorable. "Reaction has ranged from euphoria—no, you'd better make that real excitement," Wolff laughs, "to one client who said I was too dramatic and provocative." Wolff, who wears his curly black hair on the longish side and sports a bushy moustache, comes on as a bit too "California-ish" to suit some Eastern tastes, but he has no apologies for either his appearance or his approach. "That client shouldn't be getting this product," he says, explaining that the emphasis on the human element in both subject matter and presentation is deliberate. "I *am* dramatic, I *am* emotional. My object is to shake people up."

Texas Instruments, for one, is pleased both with the results and with Wolff's approach. "We've been working with Tony for some time on focus-group studies," says Roger Fonorow of TI's Strategic Business Planning Group. "We give him an A. He's an expert in group reactions." Fonorow says the first report in the ConsumerVision series tends to confirm what TI has already found in its own market research, but he adds that "it's always nice to have your ideas confirmed."

Fred Altomare, an Infocorp marketing vice president, says ConsumerVision has helped his company get a better understanding of its own statistical research.

As a result of the first ConsumerVision tape, Infocorp modified its own forecast for mobile computer sales. The company still sees a boom, but not as soon as it had once predicted. Infocorp's Matlack says that the tape "did cause us to go back and rethink what the imminent potential was." For example, Wolff's study indicated that, contrary to the conventional wisdom, the real market for small portable computers is probably not insurance agents and field salespeople but high achievers and other business people who already use a micro at the office.

Quality vs. Quantity

Although Wolff's focus on small groups diverges from quantitative market-research methods, his approach is not new. Ever since the '60s, researchers have employed focus groups to arrive at qualitative results in an effort to figure out what consumers *really* want as opposed to what they *say* they want.

As Wolff explains it, the concept of focus groups grew out of psychologist Carl Rogers's work with nondirective group interviews. "These are basically therapeutic situations where you have a moderator who sits in a room and says 'uh huh,' and 'what do you mean by that?'—words that have no content but are probes.

"My background was also in group-process psychology," Wolff says. "The whole orientation is to get a group of people in a room together and to get through their first responses. If the moderator is effective, you get below the surface of the glib answer—you get to the more subjective and emotional reasons why people do things."

Wolff's research is often intriguing. For instance, he's found that although people invariably give an interviewer all the objective reasons for buying a particular computer system, it is the subjective reasons that finally govern a person's actions. "My point is that people's decisions in life generally, and in buying products specifically, are variable and based as much on subjective inputs as on objective inputs. The microcomputer industry either never knew that or forgot it," he says. Because the industry has been driven by technology, it seems to say, "If we can provide you with a better set of features than our competitors can, then we'll make a million dollars." In certain markets that may be true, Wolff says, but he asserts that "even in the military, even in MIS departments, even with these people who say decisions are based on objective facts and nothing else, I don't believe it."

Coming up with these qualitative results, however, begs the question of what comes next. Indeed, the notion of qualitative research is the black sheep of the market-research community, somewhat akin to the anecdotal cure in medical research. In theory it makes sense to probe people's superficial answers to questions, but qualitative researchers get into trouble with their hard-number brethren when they try to extrapolate broader conclusions from those in-depth interviews.

"It's a black sheep for two reasons," says Infocorp's Altomare. First, it's a controlled process that's subject to manipulation, and second, even if the results are relatively clean, what do you do with them? Altomare sees qualitative research as more of an insurance policy than

A. Richard Immel is a contributing editor of *Popular Computing*.

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Inquiry 44

a trailblazer. "It protects your organization from your own myopia; do we really have the blinders off? It's not a case of are we doing things right, but rather are we doing the right things?"

Wolff, however, delights in his role as a self-described gadfly of the market-research industry. "I get thrown out of market-research meetings all the time because I'm fairly iconoclastic when I talk about research," he says. "Traditional market research almost eliminates the value of focus groups. They say you can't make decisions based on them, it's only for idea generation."

Wolff says the market-research community is racked by controversy over exactly what constitutes effective consumer research. He acknowledges that "the worst thing a company can do is to use focus groups to make decisions on a product. It's a biased sample, it's a small group, there are all sorts of group influences, and you're talking to only about 80 people altogether." However, for the marketer who makes his own decisions, Wolff notes that "listening for threads, listening for ideas, and bringing one more expert into the decision-making process can be the greatest thing in the world."

ConsumerVision itself may not be the greatest thing since the invention of the bipolar semiconductor, but it certainly does bring another dimension to a part of the research business that needs all the credibility it can get. More important is what the manufacturers, sellers, and other receivers of this information do with it. If it never gets to the top, if it gets there and is ignored, or worst of all, if it gets passed on to some ad agency as a blueprint for pushing the right motivational buttons in lieu of any substantive change in the product, then the client is no better off and neither are consumers.

In any case, if you're a shopper or computer professional of some sort, just remember: somewhere, somehow, sometime, when you least expect it, someone may come up to you and say, "Smile, you're on ConsumerVision." □

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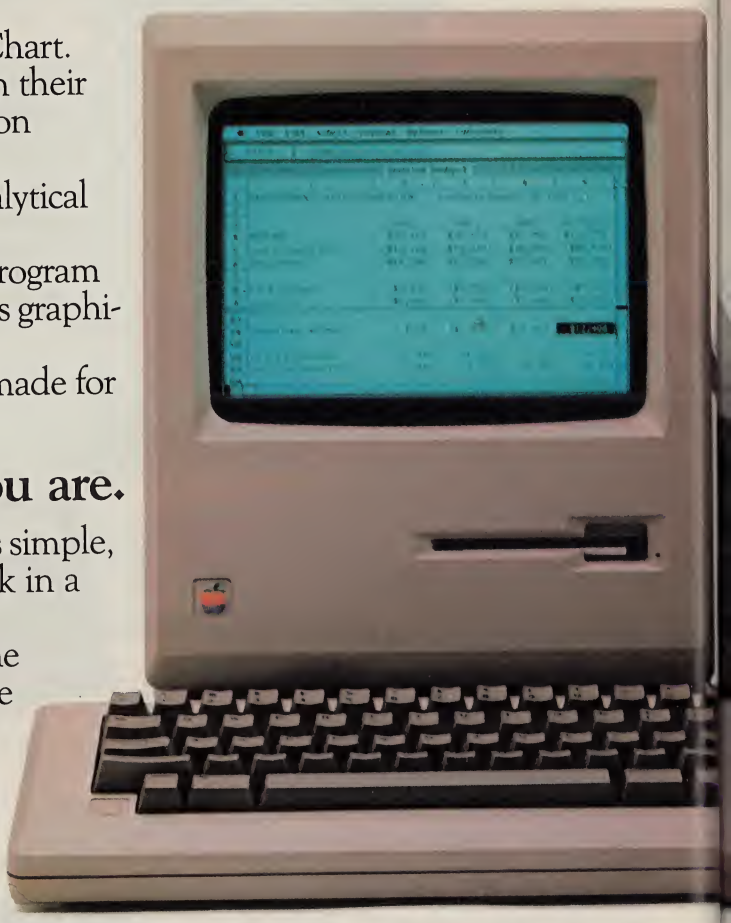

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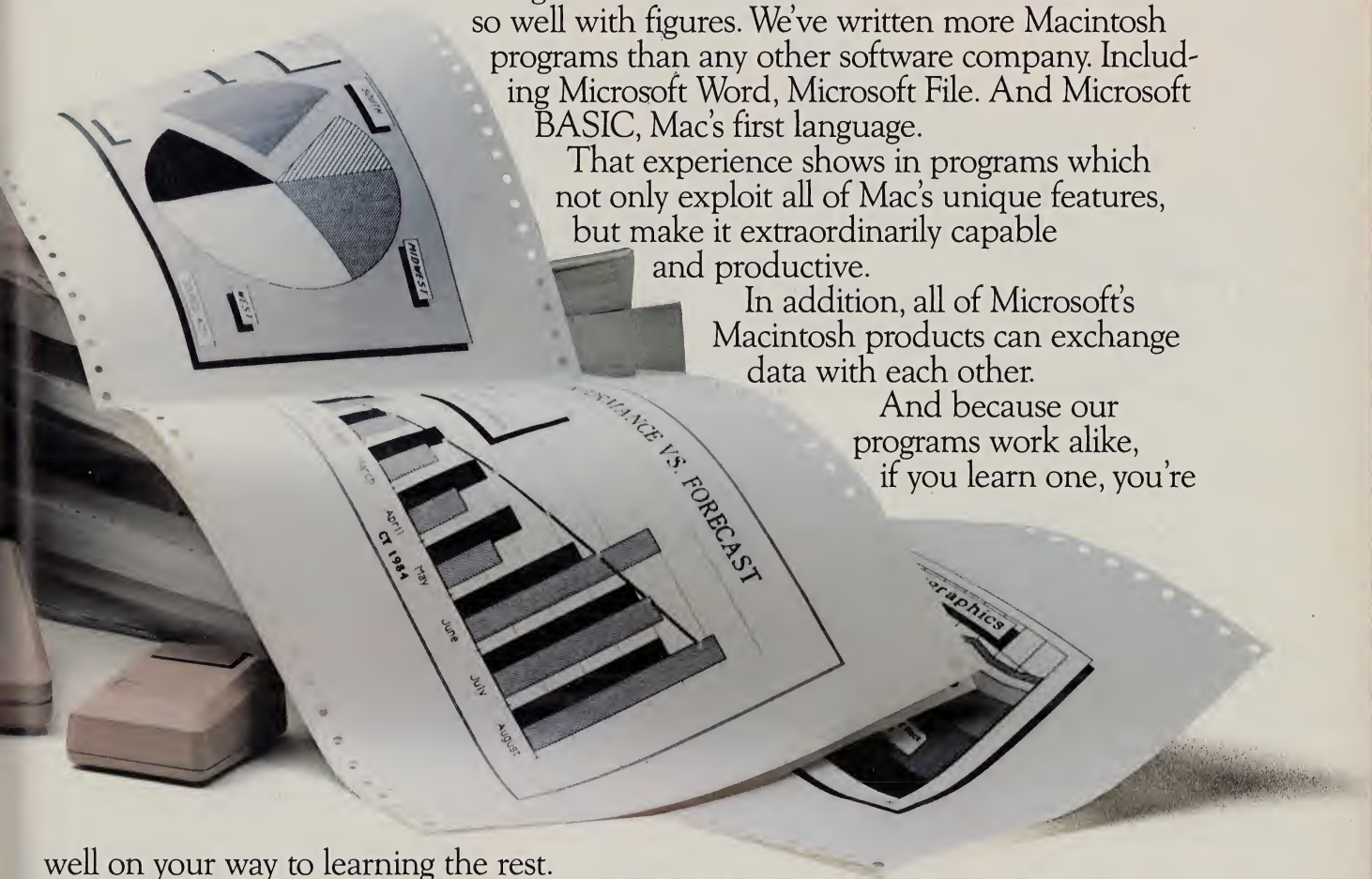

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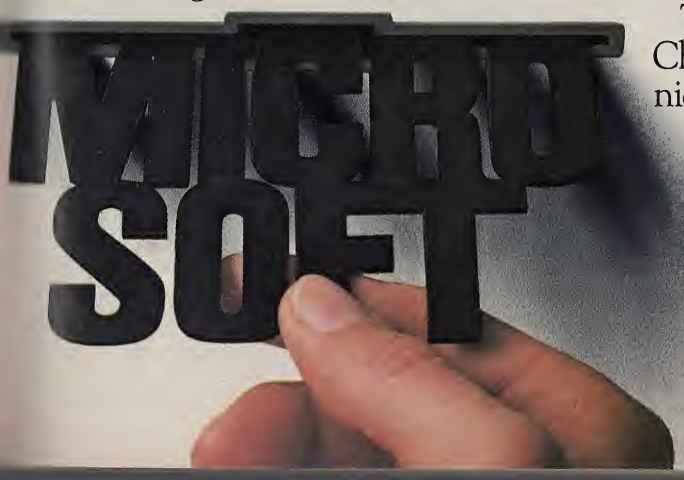

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Inquiry 25

Computers on a Chip

The future of the silicon microworld

by Matthew McClure

How many angels can dance on the head of a pin? Scholastic philosophers didn't get beyond the pure research stage with that academic question, but it illustrates one of man's innate preoccupations: just how many objects will fit in a given area? Of course with angels and heads of pins, there's no practical application, but in the modern version of that question—how many transistors can fit on a fingernail-sized chip of silicon?—the applications are eminently practical.

The world's first integrated circuit, developed in 1958 by Jack S. Kilby at Texas Instruments, contained just one transistor, along with one capacitor, and the equivalent of three resistors. Nowadays, the number of discrete electrical elements on a chip approaches half a million. It's approaching the dream of a computer on a single chip; a micro in a matchbox.

With computers, smaller *is* better, because small components give us faster operation and increased potential, and time is money in our society.

Electrical signals travel extremely fast, but the farther they have to travel (such as through wires from one chip to another), the longer it takes. In addition, connections between discrete components reduce reliability and increase production costs. So you put all your circuitry on one chip and get bargain-basement watches and calculators that do just about everything but count angels. And as the technology improves, you produce more sophisticated devices for everything from satellite transmission to artificial intelligence. The denser the chip, the faster the operating speed and the lower the cost per function.

Robert Johnson holds a "superchip," a large wafer of silicon integrating many ordinary chips.

Photograph by Andrew Popper

Technology Moves On

The current state of the art is VLSI: very-large-scale integration, with more than 100,000 devices on a chip. Several companies, including Motorola, Intel, National Semiconductor, Harris, and Texas Instruments, are mass-producing chips in this range for a number of applications. Intel's 256-kilobit RAM chip in Apple's 512K-byte Macintosh is a good example. It's one of the most complex memory chips in large-volume production.

If VLSI is here, can ULSI—ultra-large-scale integration—be far behind? Such devices, with a million or more components, are indeed almost within reach. Mulhan Rao of Texas Instruments sees mass-production ULSI chips coming sometime in the 1990s. One limiting factor is resolution: how fine a line can you draw for the signals to pass through?

As Rao points out, today's manufacturing processes already approach atomic dimensions. "The separation between silicon atoms is a

few angstroms. The typical conducting path in today's VLSI circuits is about 2 microns wide, or 10,000 angstroms." That's just 2000 *atoms* wide. "In metal-oxide semiconductor (MOS) technology," Rao says, "the effective thickness of a chip's electrical insular layers is only 200 angstroms, and that's about 40 to 50 atomic layers of silicon dioxide. Building a ULSI circuit on one square centimeter of silicon will be a major challenge. It's not only a design and development problem, but also one of production.

"To build an ultra-large-scale integrated circuit, we'll have to halve the current insulator thickness and improve our lithographic resolution from 2 microns to half a micron. And remember that we now build integrated circuits in two dimensions. For the future performance we seek, we'll need a three-dimensional design—a geometric database in silicon. You can imagine the difficulty."

It's indeed difficult, and there are other problems. Take input/output, for example. When you integrate what used to be a dozen chips into one piece of silicon, how do you communicate to the outside world with only 40 pins? The architecture for exchanging information becomes Byzantine. How do you avoid receiving unwanted signals from nearby circuits? Inductive coupling tends to occur from 2 microns down. How do you reduce power consumption and dissipate the heat generated by ultra-dense circuitry? Thousands of engineers are searching for answers to these questions.

Built-in Redundancy

Finally, particles in the air and impurities in the silicon loom large at the atomic level. You can't really fabricate a quarter-inch chip with hundreds of thousands of perfect components because contamination reduces the yield. This may be the biggest problem of all. Roughly half the circuits on a typical chip will be defective, and there's no way to predict which ones they'll be. So you must find a way to test the circuits, find the faulty ones, and reroute the signals. That's usually done with a technique called redundancy. Extra transistors are designed into the chip to substitute for defective ones.

Redundancy can be achieved in principle, says Richard Eden of GigaBit Logic in Newbury Park, California, but it increases the overhead on the chip. "The extra transistors occupy a lot of space on the chip, and the result is decreased power and performance. Moreover, the portion of the circuit that's trying to enforce the redundancy may also be defective."

Gene Amdahl, president of Trilogy Systems in Cupertino, California, cites similar problems. Amdahl supervised 300 engineers working on wafer-scale integration, seeking denser chips without pushing the design limits for ultra-small size. "The biggest challenge is to get a yield anywhere near suitable levels," he says. "We know we can't produce chips with no defects or impurities, so we need redundancy in the system. But we also need a testing method that tells us where redundancy is required. Then we have to somehow reconfigure the chip to correct the faults found in testing." One successful approach at Trilogy involved strings of circuits rather than single ones. "You could test whether a string performed the logical functions you wanted. If it didn't, you connected to an alternate string.

"Because we didn't press the limits of resolution, our problems were strictly the more practical ones, like clocking and design modifications." Even so, solving all the problems and incorporating the solutions into one dense chip is a formidable task. "The number of interrelationships that must be handled seems to go up geometrically," Amdahl says. "The problem becomes very complex very quickly."

A Different Approach

Most companies are refining and improving conventional integrated circuit technology to build their "superchips." Mosaic Systems, started by Robert R. Johnson two years ago in Troy, Michigan, is trying a simpler approach. A computer engineer can order a wafer-scale circuit composed of commercial, off-the-shelf chips. Mosaic then mounts the small chips on a larger wafer of silicon that contains a microscopic interconnection network. Dr. Johnson explains how it works:

"Suppose you coat the surface of a conventional silicon wafer with thousands of parallel lines, vapor-deposit lines representing wires, all going in one direction. Then deposit another set of lines at right angles, and you can get about 1.7 million intersections. The resulting grid is then coated with a layer of nonconducting amorphous silicon and can be programmed to carry signals from any intersection to any other intersection by creating a conductor to link different portions of the grid. You then can take selected chips in their raw form, unpackaged, and bond them to the wafer, connecting their output pads to the grid with more conductors." Thus, the grid carries signals from one chip to the next.

Johnson anticipates delivering a working product to Mosaic's first customer sometime this winter.

MIT's Lincoln Labs in Lexington, Massachusetts, have developed a digital processor on a 2-inch square of silicon. This complementary metal-oxide semiconductor (CMOS) design has 130,000 active transistors out of a total of some 400,000, to provide for redundancy. According to Jack Raffel, who led the project, MIT used a 5-micron design to avoid unnecessary complications related to pushing the limits of resolution. The chip will be used for signal processing, and MIT is working on transferring the technology to RCA.

MIT also is fabricating a specialized chip for statistical analysis; the chip is three times as complex as the digital processor. Raffel says his group plans to move on to ULSI as a longer-term objective, perhaps within the next couple of years.

Matthew McClure was Managing Editor of the *Whole Earth Software Catalog* and is now Research Director of the *Whole Earth Review*. He lives in Petaluma, California.

"I don't see any major conceptual stumbling blocks," he says. "There's just a lot of work to do."

Where We're Going

Hardware and software engineers have played leapfrog ever since computers arrived. New machines come out and programmers explore their limits, just in time for a new machine, followed in turn by a new language, a new operating system, and another new machine. Now it looks like ultra-large-scale integration will form the basis for the next cycle. Perhaps the hardware people can sit back and relax while the software designers catch up. The computer on a chip could herald a golden age of programming: abundant LISP and PROLOG machines for artificial-intelligence research, elaborate operating systems on a chip, graphics languages, network designs, firmware for increased speed—and maybe the promised Fifth Generation.

New technologies are expensive initially and usually develop slowly, so it may be awhile before we see ULSI in personal computers. It could take five or ten years. On the other hand, considering the research effort and the speedy arrival of the 256K-bit chip, we might see something in the near future. Engineers are talking about being at the right point on the learning curve, where breakthroughs come quickly. The leapfrog game for the next couple of years should be fun to watch, and even more fun to play.

Where will it all end? With improvements in existing technology, ULSI chips with 10 to 100 million components are a distinct possibility by the turn of the century. What's beyond the 1990s is almost too speculative to talk about. How we'll grow perfect chip layers one atom at a time is hard to predict.

Of course, our travels in the microworld of ULSI could ultimately lead to a whole new design approach. "Our present component technology should take us to tenths-of-a-micron levels," says a scientist with a large western research laboratory. "As we keep shrinking our circuits, we'll encounter new problems in physics. When we solve these, we'll get ideas for different and better parts. As a result of the anomalies along the way, we might develop totally new concepts. Someday we'll reach the point where we're working with the characteristics of individual atoms, instead of molecules. We'll use these subatomic characteristics to design new devices."

As the scientist hastens to add, this is just something he dreams about. Strange things happen at the quantum level, and further speculation would probably enter the metaphysical realm. But it does make one wonder:

How many angels *can* dance on the head of a pin? □

New Hampshire's DEC Deal

A controversial plan to put a micro in every classroom

by Dan Watt

New Hampshire, the Granite State, is known for its first-in-the-nation presidential primary, its fierce New England pride, and its commitment to local control. Its Republican governor, John H. Sununu, is known for his staunch pro-Reagan conservatism, for his support of the financially troubled Seabrook nuclear power plant, and for creative financing of state government (New Hampshire is the only state in the Union that has no sales or income tax). But when Sununu attempted to apply creative financing to a statewide plan for purchasing school computers, he raised a storm of controversy that kept educational computing on New Hampshire's front pages for months.

Last June, Sununu announced with great fanfare that he had privately negotiated a $33 million deal with Digital Equipment Corporation to put a DEC microcomputer into every New Hampshire classroom by 1987. Sununu's deal would have allowed school districts to pay only $575 for a DEC Rainbow 100—a dual-processor computer that runs both MS-DOS and CP/M software and that normally sells for $3320. DEC would sell the computers to the schools at a 50% discount. The rest of the money was to come from an estimated $3.5 million surplus generated by the New Hampshire Sweepstakes.

During the first year of Sununu's three-year plan, the computers would have been earmarked for grades three through six. Later they would spread to other grades.

When asked why he had selected Digital, Sununu explained that the Massachusetts-based firm, which employs more than 6500 workers in New Hampshire, was the only computer company willing to enter into a long-term partnership with New Hampshire teachers. In addition to supplying computers at half price, the company agreed to provide teacher training, to establish two special hot lines, and to employ three full-time support persons for the project.

Governor Sununu arranged to buy DEC micros for $575 each.

Photograph by John Baptista/The Keene Sentinel

The Band-Wagon Effect

Within a month or so of Sununu's announcement, about one-third of the state's 168 school districts had signed up to purchase some 640 DEC Rainbows, according to Stephen Kennedy, New Hampshire's Director of Plant and Property, who coordinates all statewide purchases.

Smaller school districts, especially those that didn't yet have a computer education program, were among the most enthusiastic. But the city of Keene was also a heavy supporter from the start, earmarking some $40,000 for the purchase of 60 Rainbows, software, and peripherals. Although the city had already invested heavily in Apple computers and software for its

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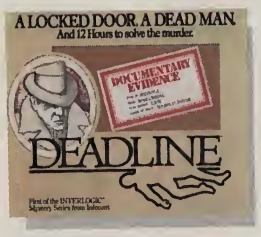
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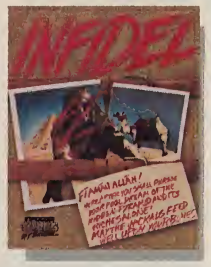

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grade schools, officials felt the Digital deal was too good to pass up.

Keene's decision brought neighboring towns into line. "We want our own kids at least on a par with Keene," said Marlborough board member Manfredo L. Torelli, citing the fact that Keene and Marlborough students attend the same regional high school.

Local Planning Ignored

While Sununu's plan was picking up support among many school officials, other officials were raising questions. Regardless of prior school-board planning, Sununu was telling the schools which computers to buy, where to put them, and what software to use. But were his choices educationally sound?

For example, was one computer per classroom really the most effective way to use computer resources at the elementary level? Or should the computers be grouped in laboratories or in school libraries? And was skill-building software really the way to go? What about word-processing and Logo? And why should Digital provide teacher training? Shouldn't local districts and the state education department be doing that?

Another question was whether the new computers and activities would fit in with what schools were already planning and doing? Although Sununu's supporters stressed that the plan was a generous effort to support education at the local level, prior local planning was totally ignored by Sununu.

State planning efforts had also been compromised. "For the past three years, we've been working with schools to get them to decide what they'd like to do with microcomputers," explained Ferdinand Prevost, computer education consultant for the state Department of Education. "Then they should find software to do it and then buy an appropriate machine to run that software. We've been promoting that kind of planning, trying to discourage the outright purchase of hardware."

Software was a problem, too. Compared with Apple, IBM, Commodore and Radio Shack, which have hundreds of educational software packages available, the DEC Rainbow has little available. So to ensure that the computers will be useful to schools immediately, the state contract requires that each elementary school purchase a set of Microcourse software from Houghton Mifflin's Time-Share Division (another New Hampshire-based firm). This skill-building program in language arts, reading, and mathematics includes hundreds of individual lessons (on more than 200 disks) designed to fit the existing school curriculum. But the package costs an additional $2158 per school.

Creative Financing Flops

Educational considerations alone would not have put much of a dent in Sununu's plan if he'd been able to deliver the computers at the promised price. However, a series of legal and political maneuvers called Sununu's creative financing into question. A lawsuit brought by Democratic state representative Michael King questioned the Governor's right to deliver sweepstakes revenues without legislative approval. And although Judge Richard Dunfey ruled that the legislators had appropriated $4.7 million of the sweepstakes money for the schools, he also declared that sweepstakes money be distributed according to the number of pupils per school district. "It's been determined that the schools can do anything they want with that money," says Neal Andrew, New Hampshire's Deputy Commissioner of Education. "They may very well decide to use it to reduce taxes or use it for any other purpose." They might even use it to buy computers from Apple or IBM. The bottom line is that the net price on the DEC systems went up—way up—to $1734 per system.

Despite these setbacks, a contract between Digital and the state was signed in late August and will become effective as soon as 70 units are ordered. The agreement provides computers for all grade levels at $1734 per system (more than 50% off the Rainbow's retail price with operating system software). Options such as a maintenance contract, a three-day teacher-training program, and a printer would add another $632. And although high schools can purchase software from a list provided by Digital at a 40% discount, elementary schools must first purchase at least one complete $2158 package of the Houghton Mifflin skill-building software.

School districts that jumped on the bandwagon in July, when the price was $575, jumped off just as quickly when the price went up. All of the 640 orders made when the deal was first announced were withdrawn by late September, according to purchasing coordinator Kennedy.

A Chance for Partnership

When Sununu's deal fell apart, the real losers were New Hampshire students and teachers. In many communities, momentum for computer education programs has slowed considerably.

The Digital Equipment Corporation has a long history of support for educational computing at the college level and has made significant contributions over the years of both equipment and services to school districts near its installations. The major strength of Sununu's plan was the opportunity to extend this type of support statewide.

The concept deserves another chance, and I hope that the next round of negotiations includes local teachers and administrators from the start. State government and computer companies can play pivotal roles by providing hardware and software, financial support, training, and technical expertise. But the schools should decide where and how to use the equipment and what software to buy. With local educators back in the driver's seat, computer education in the state of New Hampshire could really take off. □

Dan Watt is a contributing editor of *Popular Computing* and the author of *Learning with Logo* and *Learning with Apple Logo* (BYTE Books/McGraw-Hill, 1983).

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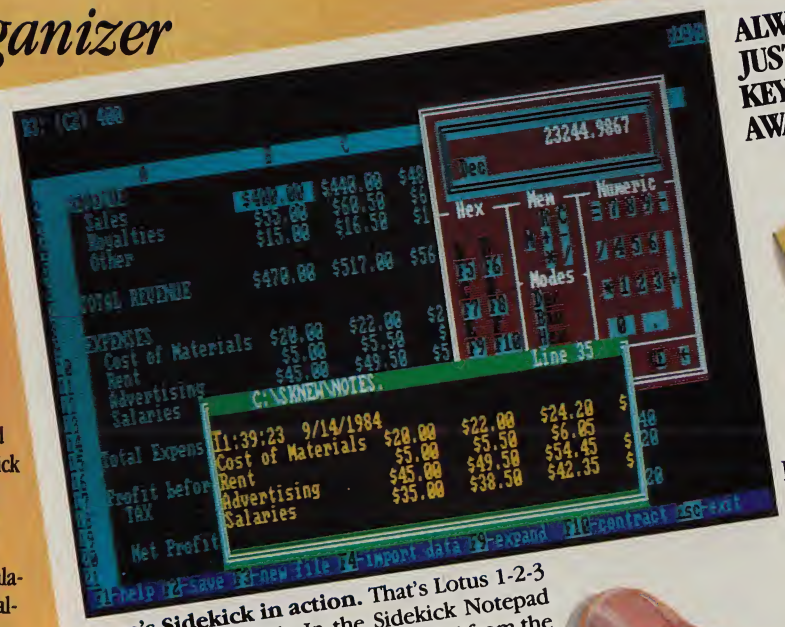

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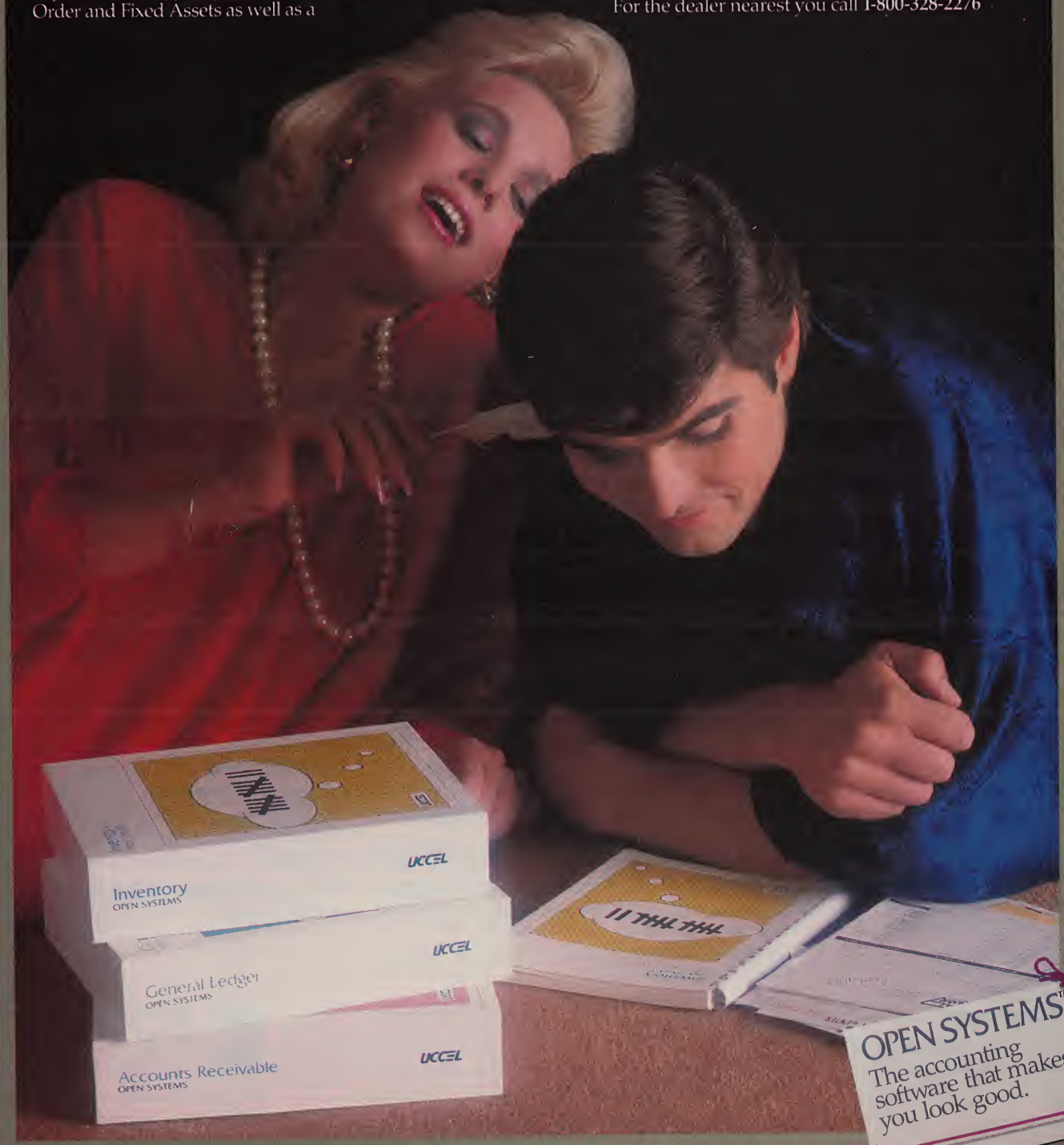

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A Computer Science Glut?

Alternatives to a CS degree are well worth consideration

by Jerry Pournelle

It's the latest educational fad. If you go to college, you study computer science. Things have gotten so bad that MIT is limiting the number of electrical engineering and computer science majors. Other colleges are doing the same. Total student enrollment is down, but you won't see evidence of that in the computer lab. For the next few years the electrical engineering and computer science departments are going to be *crowded.*

It has all happened before. A few years ago petroleum geologists were in great demand. Students flocked into those courses. Hordes graduated, and there weren't enough jobs for them. The National Academy of Sciences remarked that the whole episode looked like a parody of manpower allocation planning.

Much the same happened in biology. I know two Ph.D. biologists who, having despaired of getting jobs in their own fields, turned to work in computer science. Won't the same thing happen in computer science? Won't computer engineers and scientists be a glut on the market and be forced to find employment in another, less crowded field?

Probably, but not for some time. The computer revolution is fundamental and real, and the country's demand for computer knowledge is no whim. The government estimates that by 1995 there will be 1.5 million computer-related jobs, half of them new since 1983. Since there are only about 35,000 EE and CS graduates each year, there's going to be a shortfall. Computer science graduates already get top starting salaries, and at least for a while the demand for their services will rise, not diminish. The mad rush is going to continue.

A lot of my mail comes from people about to go to college. They all have the same question: "What do I study so that I can get in on the computer revolution? Should I study computer science?" There may or may not be an epilogue to the question: "Of course, I've never been good at math . . ."

About half the questions come from people who don't *want* to go into computer science, and certainly not into electrical engineering; they just think they *ought* to. After all, computer science people are sure of job offers, and according to the *Wall Street Journal* starting salaries for computer science grads are about 30 percent higher than those for graduates with a business degree. College is expensive; shouldn't one try to get the highest return on that investment?

That attitude made sense a few years ago. In those days, computer science departments were actively recruiting majors. Now they not only aren't recruiting, but are actively putting up barriers: stiff introductory courses, B averages required in all

Illustration by Dave Shannon

major subjects including calculus, and so on. If you like computer science and are willing to work hard, it's still a good field to go into; but the competition is stiff and getting stiffer as more and more students flow into the department.

Moreover, the C-average student in any field isn't going to get the kind of job that the top of the class gets. In aeronautical engineering, that C student traditionally got the job of "weights control engineer," poring over aircraft engineering drawings, counting all the rivets, and calculating their weights. It's a job that requires skill and training, but most people don't find it very interesting. The computer field is guaranteed to produce a lot of jobs like that.

If the goal is to make sure you have a job, computer science may insure that; but is it a good investment of your time? For that matter, is it a good investment of public education resources?

The theory of tax-supported higher education is that a healthy republic needs educated citizens. University dollars are investments in the future—indeed, the best investment we make. The practice is a bit different. If higher education is the best investment we make with tax dollars, why are those tax dollars allocated by the people least qualified to do it? Department budgets are determined by the number of majors the department can attract, which means that students, including freshmen, do most of the funding allocation by choosing majors. The result is that class registration often becomes a kind of oriental bazaar, with each department hawking its wares—and watering down the difficulty of its courses.

Recent popularity freed computer science of the need to recruit majors. Worse, the sudden expansion means larger classes, many taught by graduate students. Undergraduates have less time with their professors. Competition is keen, and not only doesn't the department care whether you flunk out—it seeks to get rid of some of the students. Computer science courses are a seller's market.

By contrast, the other departments *want* students. They now must compete for a smaller share of the student body at a time when the total number of students enrolled is shrinking. In many fields class sizes are shrinking, professors have time to counsel students, and the atmosphere is much more "collegiate" than it has been in many years.

The lesson is clear: if you can find a way to get in on the computer revolution without actually taking computer science or electrical engineering, you ought seriously to consider that. I don't mean to promote the philosophy that the easiest course is best, but working too hard in order to learn how to do something you don't like anyway has very little to recommend it.

Public Stenographers

One obvious alternative to studying computer science is learning to program. You don't even have to go to college for that. There are plenty of programmer trade schools, and many will "guarantee" jobs for their graduates. In most cases the guarantee turns out to be so hedged round with restrictions that it's worthless, but that's another story. The ability to write applications programs for computers—that is, to make the machine do something specifically described by the customer—is usually salable, and most of those who know how to program will be able to find jobs.

They might not be good jobs. The top pay goes to systems programmers: those who know how to get inside the machine and alter its most fundamental instructions. It isn't invariably true that systems programmers are graduates of university departments of computer science, but many are, and as time goes on nearly all will be. Applications programmers get the leftover jobs. Moreover, as micros become more widespread, nearly *everyone* will know a good bit about applications programming. Programmers who know only programming will be like public stenographers: members of a dying profession, sometimes interesting, but not often envied.

Reaching Out

The micro revolution affects everything. The beginning of the Industrial Revolution came with large steam engines. These were kept in centralized shops, and though the products of the Industrial Revolution showed up everywhere, it didn't directly touch many people's lives. Then came the small electric motor, and that had a direct impact on nearly everyone. Dishwashers, electric drills, electric mixers and can openers, frying pans, microwave ovens, fans and air conditioners, and all the other products of the electric motor directly affected the way we lived. There were very few professions not changed by small electric motors.

The same was true of the computer. The first computers were kept in central locations and directly affected almost no one. The microcomputer is changing all that. Everyone either has a computer or knows someone who does. They are everywhere—and they're going to affect nearly everything we do. Very few professions will not be changed by small computers.

This, then, is the key to getting in on the computer revolution. Every profession will be affected; those who first see new ways to apply computers to old jobs will get rich. At the moment, there aren't too many people who know how to program; but as the machines get more memory and run faster, programming languages get more powerful yet simpler to use.

It will not be long before it's far more important to think of new things for the computer to do than it is to know how to teach it to do them. It's all very well to learn programming, and you should; but knowing how to program is like knowing how to read and write. The time is coming, sooner than most think, when lack of the ability to pro-

Science fiction writer Jerry Pournelle, who joined the micro revolution eight years ago, is a contributing editor of *Popular Computing*.

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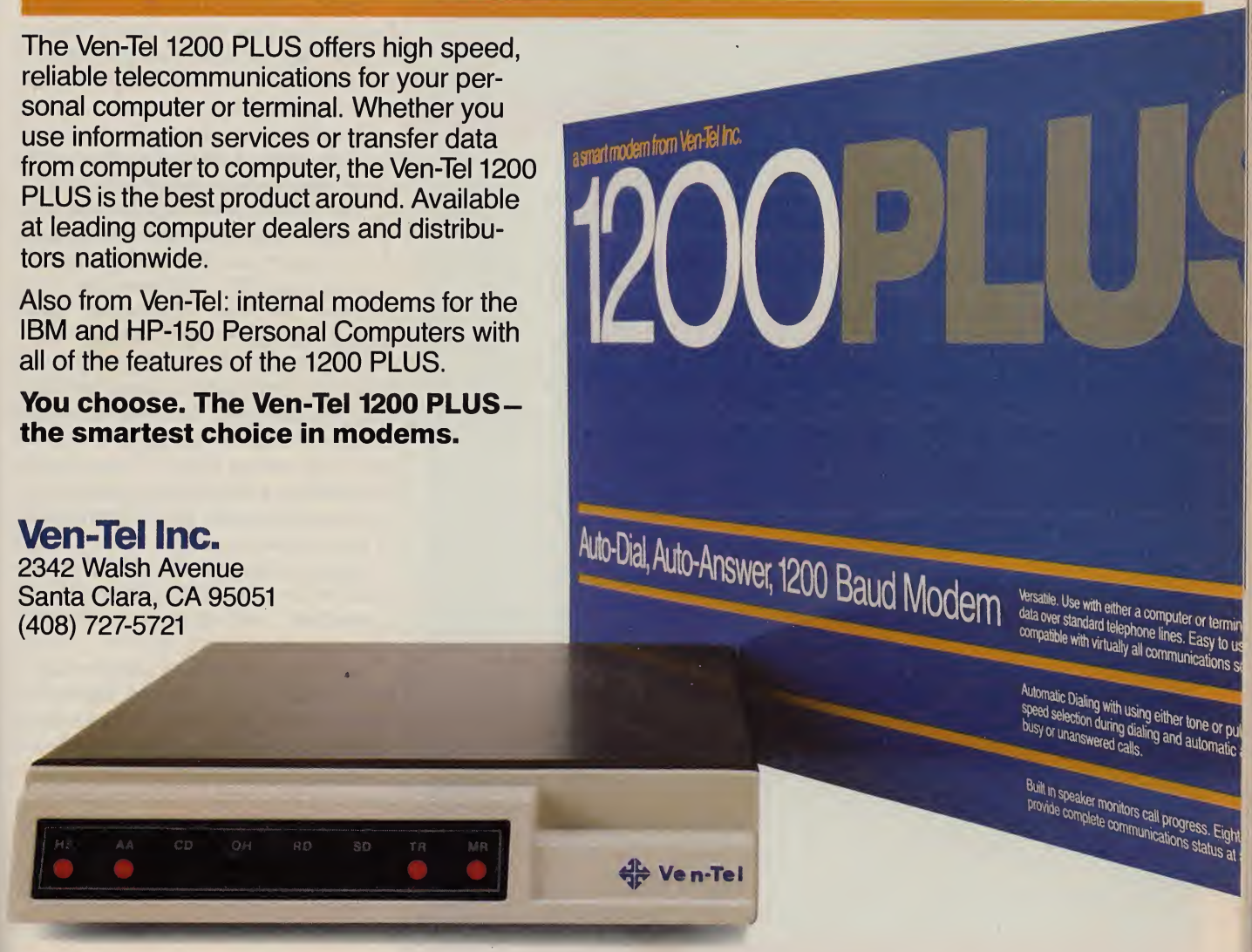

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gram will keep you from getting most jobs, just as being illiterate keeps you out of most jobs; but merely knowing how to program won't be enough to guarantee a job any more than knowing how to read and write will do that.

Thus when young people ask how they can get in on the computer revolution, I generally tell them the trick would be to avoid the most obvious routes. Almost every profession is going to be changed, many profoundly; therefore, study what you like doing—the most I can wish my children is that they, like me, get to spend most of their time doing what they want to do—and when you study, think about what computers can do to make the work easier and more productive.

You'll still have to work—Pournelle's Law states that if they have to pay you money to get you to do it, it's w-o-r-k—but it can be interesting work.

Computers are going to change the way we do everything. Some of those changes are obvious. Accounting has already been revolutionized by small computers, and it's going through more startling changes even as I write this. Architecture is another obvious candidate for change: computer systems can not only save time in making original drawings, but also can make subtle changes and put out new copies, change perspectives, keep a database that keeps track of materials and costs as a function of changes to the drawing, and in general do most of the onerous work.

Engineering, aircraft design, naval architecture: again it's obvious that computers will have a profound effect.

The whole financial community has already been affected. Spreadsheets and other tools for financial modeling and prediction have changed the way analysts work. Not long ago, for a lark, I did a stationary time series on pork bellies. Stationary time series is a complex system of mathematical analysis developed originally to help anti-aircraft guns predict where an enemy airplane

would be by tracking where it had been. It turns out to work pretty well on pork bellies (alas, I didn't have the courage to invest in the results of my analysis, which is a pity; I could have made a lot of money).

The computer revolution is already changing the course requirements in business administration schools, but so far the effects have mostly been confined to the financial analysis departments. At the moment, employers think they have to hire programming specialists; but well before 1994 they'll expect all their junior executives to have programming skills.

Some applications aren't so easy. Despite IBM's advertisements, I don't myself see how bakers and hat makers will apply small computers to their work. (Well, some applications such as bookkeeping and inventory control are obvious, but those apply to *any* business). However: someone will see the application, and after that it will become routine.

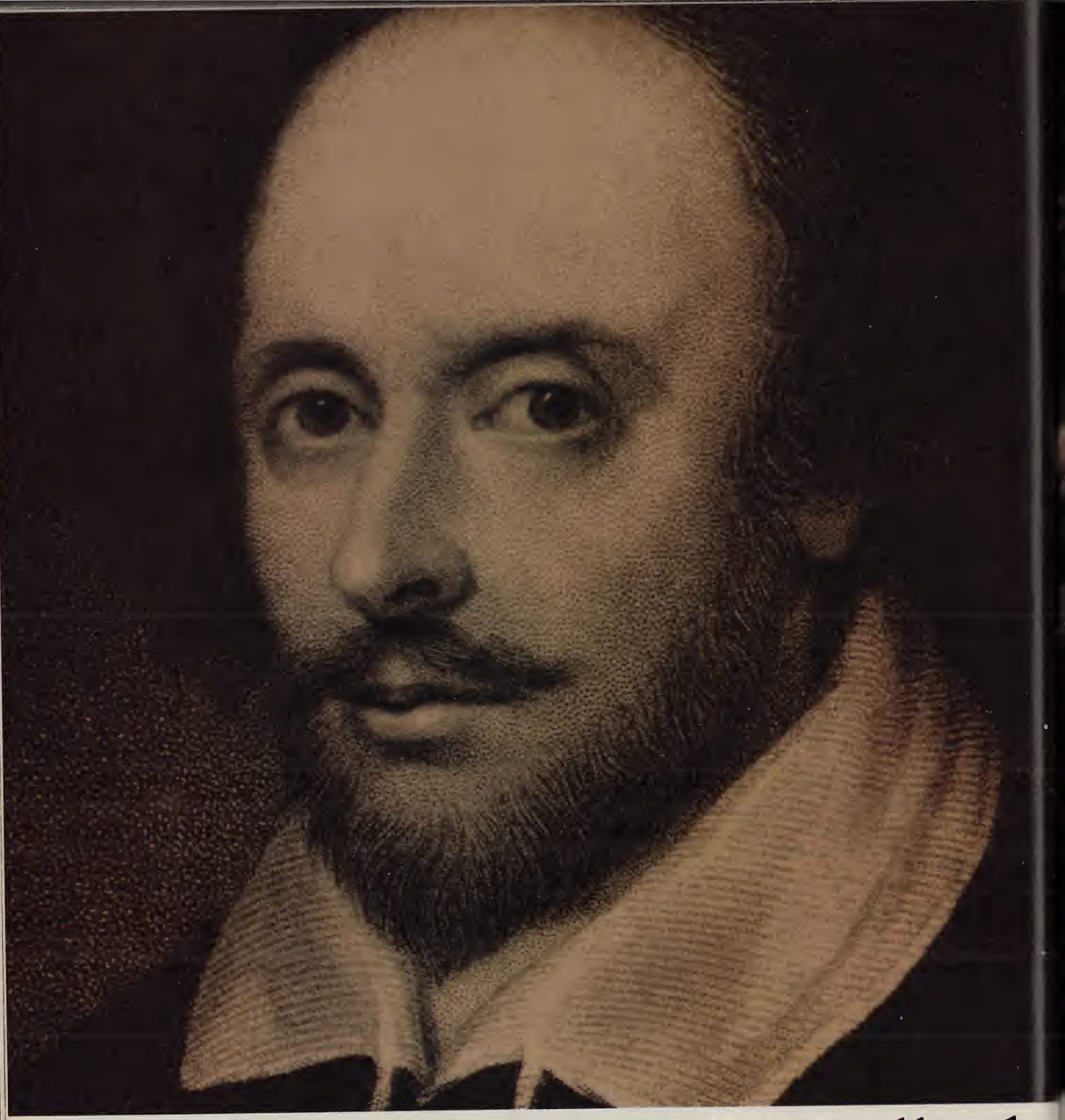
Other businesses, such as airlines, have used computers for a long time. No matter. There are still applications they haven't thought of. The people who do think of those applications will do well.

Government and elections: the possibilities are endless. Computers can digest a *lot* of information. It is inconceivable that this capability won't be employed, for better or for worse.

City governments can certainly use computers for tax assessment. Fire departments can store data on composition of houses, water sources, etc. Police departments already use computers, but not enough, and not always wisely.

There isn't anything people do that computers won't affect. My advice is simple. Learn how to do something you like to do. Then see how computers can do it better. That way you can get in on the computer revolution and have some fun too. □

Jerry Pournelle welcomes comments from members of the micro revolution. Write to him c/o *Popular Computing*, POB 397, Hancock, NH 03449. Jerry tries to answer all his mail but cannot promise individual replies.



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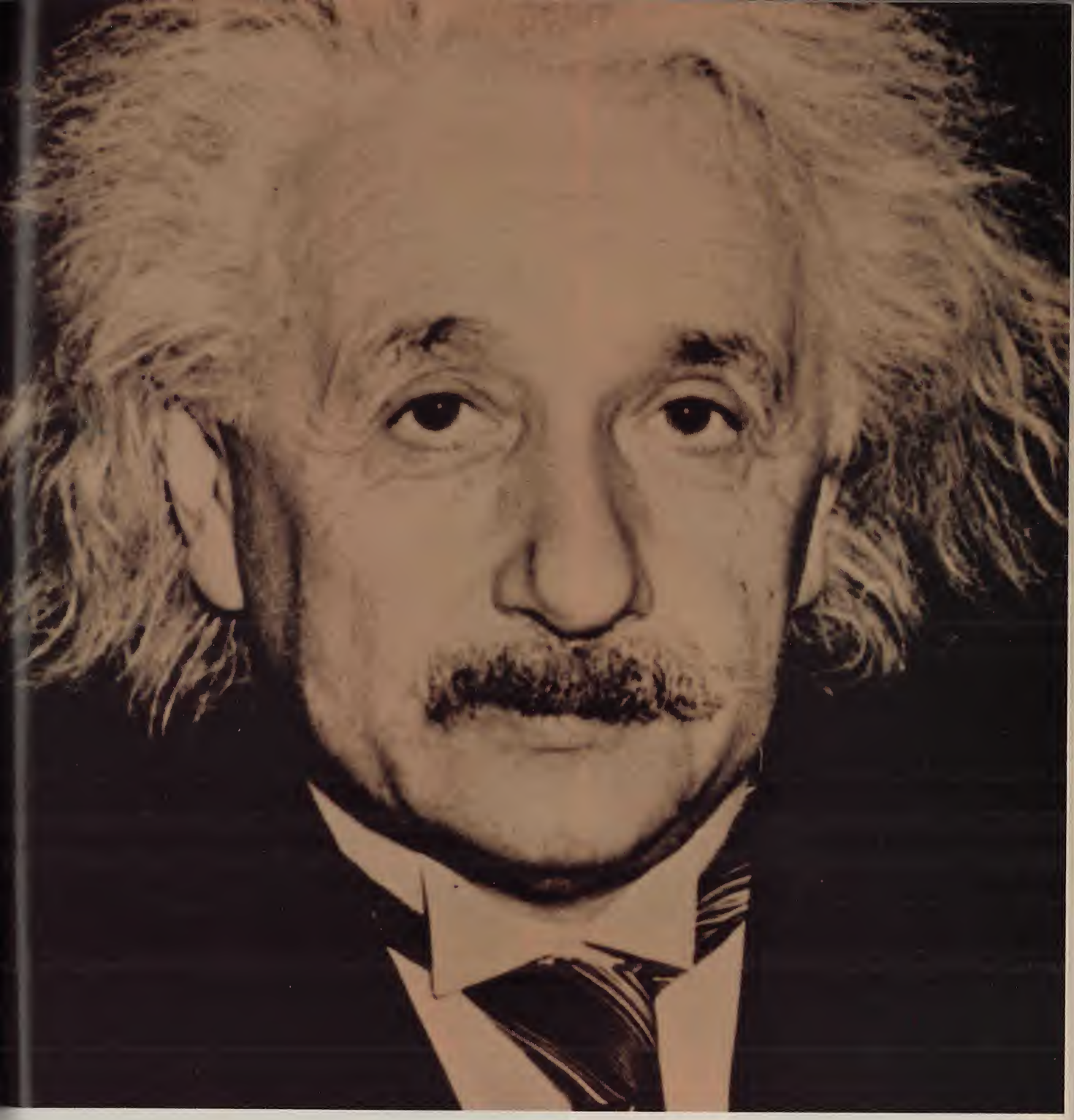

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FEBRUARY 1985

THE RISING STAR OF EPSON

Is the QX-16 with Valdocs a "fantastic machine" or an "embarrassing failure"?

COVER STORY by Jonathan Sacks

There was precious little excitement this past October when Epson America called a press conference to announce its second-generation personal computer, the QX-16. In too many ways it seemed like déjà vu. While the Epson name has come to represent the standard in dot-matrix printers (with an estimated 40 percent of that market worldwide), the company's one desktop computer to date—the QX-10—can only be classified a failure.

The new Epson machine is essentially an updated QX-10 with IBM compatibility thrown in for good measure. It bears so many harrowing similarities to Epson's earlier machine—including a dependence on a troubled software package called Valdocs—that one industry insider asked an Epson official whether the whole thing wasn't a bad joke.

Jonathan Sacks is a West Coast editor of *Popular Computing*.

Illustration by Steve Carver

To understand that kind of reaction, you have to know a little bit about the rise and fall of the QX-10. That first-generation Epson, released with great fanfare and a huge advertising effort in late 1983, was elegantly designed, with a spectacular keyboard and a crystal-clear bit-mapped screen. But it was built around an 8-bit Z80 microprocessor at a time when the 16-bit 8088-based IBM PC was fast becoming the standard. Even worse, the QX-10 had a $2995 price tag—hundreds of dollars more than other 8-bit machines.

Epson's only hope for the success of the QX-10 lay in a revolutionary software package called Valdocs, which came bundled with the computer. Valdocs featured a word processor, a calculator, a "draw" function (that created bar, pie, and line graphs), an electronic mail function with an electronic address book, and a computerized date book.

It also had a user interface that was meant to change the way people worked with computers. Its designer, a visionary named Chris Rutkowski, wanted the computer and the software to be so simple that a neophyte could operate it without opening a manual. He designed the QX-10 keyboard so that, when used with Valdocs, all computer functions could be activated by hitting a single key.

And the keys were labeled in English. A key labeled Menu gave you a menu, a key labeled Draw put you into the draw program. To store a document, you hit a key labeled Store. The text editor was "what you see is what you get." You could boldface or italicize (on-screen and in print) by hitting a key labeled Bold or Italic. You got extensive on-line help for each application just by hitting a key marked Help.

Valdocs was brilliant in its simplicity, and immediately following its announcement, the reviewers went wild. But soon problems began to crop up. Entire documents would disappear in Valdocs for no apparent reason. The electronic mail function usually didn't work. And the whole thing was painfully slow—it took a half minute to delete a block of text and a full minute to delete a file.

Epson and Rising Star, the American software company contracted to write Valdocs, promised fixes and upgrades. Then they missed their own deadlines. Within months after its introduction, the reputation of the QX-10 was forever stained by the debacle of Valdocs. Even Epson's efforts to sell it with a free printer and additional software failed to bolster sales. A year later, the machine was widely discounted to $1595, and QX-10 unit sales still accounted for less than one percent of all personal computer sales.

A New QX

And so, on that October day in Torrance, Epson had a grim history to overcome. High-ranking company officials flew in from Japan to join American executives in hours of windy speeches that reaffirmed Epson's commitment to carving a niche in the American computer market.

But when at last they introduced their new machine, it seemed that in ignoring the lessons of history, these men were doomed to repeat their embarrassing failures.

Like its predecessor, the QX-16 uses a Z80 microprocessor to run CP/M and a new version of Valdocs, called version 2.0, which is slated for release by the time this article is in print. In its sluggish way, Epson has also finally given its computer IBM compatibility by including an 8088 coprocessor and a special graphics card that allows it to emulate the IBM PC. Epson claims that the QX-16 is capable of running 90 percent of the programs available for the IBM.

The machine comes with two 5¼-inch slimline disk drives, which have 360K bytes of storage each in the 8088 mode and 768K bytes of storage (quad density) in the Z80 mode. (A hard disk is available from Comrex, a subsidiary of Epson's parent company, Suwa Seikosha, a manufacturing unit within the Seiko Group.) Also included are a Centronics-compatible parallel port and an RS-232C serial port. The QX-16's standard 256K bytes of RAM can be expanded to 512K.

Although the system's three expansion slots will not accept IBM cards, Epson says it will release its own expansion cards in the future.

The standard monochrome monitor is driven by 128K bytes of dedicated video RAM and an NEC 7220 graphics chip. The 12-inch bit-mapped screen has a dot resolution of 640 by 400 in Valdocs and 640 by 320 or 320 by 200 in MS-DOS. Epson says a color monitor and color graphics card will be available in the future.

The QX-16 keyboard is a Selectric-like layout with 18 special control keys across the top. The 10-key number pad is programmable via the "Defkey" function, which is part of Valdocs 2.0.

At the time this article went to press, the company had not settled on a final price for the QX-16. It promised a price of "under $3000," and the final price was rumored to be around $2500.

The New Valdocs

In a marketplace that has clearly defined its most important ratio as price/performance, the QX-16 seemed destined to follow in the footsteps of the QX-10. Why, after all, would anyone want to buy an IBM compatible for about the same price they could buy an IBM PC?

"The point is that we aren't positioning this as another IBM compatible," responded Scott Edwards, marketing services manager of Epson's Company Products Division. "We don't think that's its niche. It would never sell as a compatible at this price."

So how exactly does Epson plan to market the QX-16?

"We're depending on Valdocs," said Edwards. "Valdocs is what we have that makes us special. And the latest version is great, just great. It will make the QX-16 a fantastic machine at a fantastic price."

A sadly familiar refrain, except this wasn't the old Valdocs that Edwards was speaking of, the Valdocs that had come to be known as oh so buggy and oh so slow. No, he said, the new Valdocs, Valdocs 2.0, was everything that Valdocs should have been the first time around. (See "An Early Look at Valdocs 2.0," page 64.) This version of Valdocs, Edwards said, has been speeded

up, cleaned up, and polished. This is a Valdocs to make Epson proud.

Epson put on a short demonstration of Valdocs 2.0 that day in Torrance. It included some glitzy draw and paint programs akin to what was available for the Macintosh and the IBM PC. The program now includes a spreadsheet and an improved mail function, which one Rising Star official claimed was as good as any communications package on the market.

"What we tried to do with the first releases of Valdocs was establish that it was possible to create easy-to-use integrated software," said Gordon Mustain, director of marketing for Rising Star. "What we did with version 2.0 was try to make it right."

Valdocs' Big Daddy

When you talk to people who know about Valdocs you hear one name again and again. Depending upon whom you ask, Chris Rutkowski is either a genius or a fool. For better or worse he is the man who created Valdocs and the man who knows it best. To learn more and to get a firsthand demonstration of Valdocs 2.0, I visited Rutkowski at his Carmel, California, home.

Rutkowski was the first American employee of Epson, and he claims credit for the marketing savvy that put Epson printers on top in the United States. That, he says, won him the respect of the Japanese company's hierarchy, and when Epson decided to build a computer for the American market, Rutkowski's offer of help was eagerly accepted.

Rutkowski's business card identifies him as a futurist, and from the outset of Epson's computer project, he took the long view. Plenty of computers were already out there that performed adequately, Rutkowski figured. What was missing, what was necessary before people would make computers part of their lives, was a way to make these new machines easy to use. And so, the concept of Valdocs and HASCI was born.

HASCI, an acronym Rutkowski coined, stands for human applications standard for computer interface, and as the name implies, Rutkowski thinks that someday every computer will have to meet his standard. What Rutkowski intended to create from the outset was an easy way for humans to relate to computers; an interface so simple that even a child, or "a little old lady in Dubuque" as Rutkowski would say, could sit down at a computer for the first time and make the thing work.

What he now claims, but didn't really make clear earlier on, is that the process would take some time and would be done in three phases. Phase One—the one we have seen—was the first series of Valdocs software. Rutkowski says it wasn't nearly as bad as some people thought. Phase Two—the version of Valdocs about to be released—will perfect each module. The final phase, Valdocs 3.0, will be a fully integrated, fully perfected program—the complete computer program, so to speak.

The process is evolutionary, and improvements are ongoing, Rutkowski says. What burns him is that the whole thing has been so misunderstood and maligned. "A lot of the negatives have been grossly exaggerated,"

"The criticism came mostly from computer freaks, and Valdocs was never meant to make the computer freaks happy," said Rutkowski.

he said. "You know, it's easier to criticize than to produce, and most of the people who have criticized Valdocs have never made any contribution to our society.

"The fact is that the criticism came mostly from computer freaks, and Valdocs was never meant to make the computer freaks happy. We find that there are certain types of users—those to whom ease of use was important—who loved Valdocs, despite what the critics were saying.

"On some levels, like ease of use, I would put Valdocs up against anything out there. While everyone is worrying about making people computer literate, we are really trying to make a people-literate computer. Someday, all computers will have to be that way."

And what of the specific criticisms, the fact that Valdocs was slow and infested with programming bugs?

"We got the bugs taken care of pretty quickly, and I agree that the first release of Valdocs should never have gone out to the public," Rutkowski said. "Some people said that a program as complex, as huge as Valdocs, couldn't work on a Z80. Well, I have said all along that it isn't the size of the microprocessor that counts, it's the elegance of the code. Valdocs was slower than some other programs and that was because the code had to be refined. It is a constant process. We have made 2.0 significantly faster than previous versions."

The Evolution

The development of 2.0 began with a meeting at the Saddleback Inn in Orange County, California. There, Rutkowski spent four days outlining what he wanted Valdocs to be. The thesis was a simple one. Rutkowski

wanted each module of Valdocs—each application—to be competitive with anything in its field. In other words, the Valdocs text editor had to be as good as Wordstar or Microsoft Word; the mail program had to be as good as Crosstalk.

Just as he had done for the previous version of Valdocs, Rutkowski wrote a "manual" for the nonexistent Valdocs 2.0, outlining what it would include and how each application would work. In addition to an improved "what you see is what you get" text editor, there would be an improved mail program, a spreadsheet, a card-file-type database, business graphics, and a date book.

And, two other programs—pieces of the Valdocs environment—would be offered at additional cost. One would be a draw program, something sophisticated enough so that it could be used for computer-aided design (CAD) applications. The other would be a paint program that would take advantage of full-color graphics.

Rising Star decided that, like earlier versions, the new Valdocs would be programmed partly in assembly language, but mostly in a specially designed version of FORTH that the company called R-FORTH. This despite widespread criticism that part of Valdocs' problem was its programming language. FORTH isn't generally considered slow, but critics of Valdocs have suggested that the sheer bulk dictates that it should be entirely in the more efficient assembly language.

Rising Star hired several programmers who worked on customizing the FORTH language for the task at hand—a reverse process, really, of the customization that was done during the creation of earlier Valdocs versions. FORTH is a language designed to be modified, and when the programming began on Valdocs 2.0, the kernel of R-FORTH had swelled from 16K bytes to 22K. It had to be streamlined. By the time that streamlining was done, the kernel was back down to 10K bytes.

Other programmers—some 40 in all—worked in groups to rewrite and streamline each module of Valdocs: the data-indexing system, the editor, the spreadsheet, and the graphics driver. They did all their work at home. Rutkowski, the futurist, believes that people are most productive in an "electronic cottage" environment. Also, he says, he wanted the best programmers he could find, and he knew he couldn't convince many of them to move creating a very good software package.

But Valdocs 2.0 has one obvious flaw—a lack of true integration. Although all of the modules function within the same environment, you can't move data freely from most Valdocs modules to others. In Valdocs you can draw a graph, but you can't move it into a text file. Nor, for that matter, can you move numbers from the spreadsheet to a text file. State-of-the-art integrated software lets you do those things. (This level of integration will exist in Valdocs 3.0, says Rising Star.)

What exists already—and of paramount importance to Valdocs designer Chris Rutkowski—is a complicated software package that is relatively easy to use. Rising Star officials think Valdocs 2.0 is so easy to use, in fact, that the company will issue the program with only an abbreviated (about 60 pages) user's guide, which one Rising Star executive described as "something like what you would get with a power saw."

For people who want more, a 400+ page reference manual will be available on request. A rough draft of that manual turned out to be a cookbook of Valdocs commands and features.

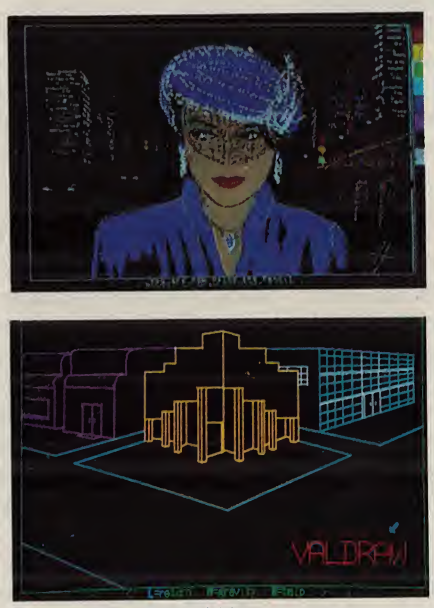
While it is too early at this writing to pass final judgment on Valdocs 2.0, several aspects of the program deserve a closer look. Valdocs is designed to work with the HASCI keyboard that comes with both the QX-10 and the QX-16. Special control keys work with the system, the files, and the applications.

The Edit key, for example, takes you into the Valdocs word processor, for which many of the other function

An Early Look at Valdocs 2.0

While Valdocs 2.0 was still in testing at this writing, it's clear that a bug-ridden prerelease version is a vast improvement over earlier releases of Valdocs.

Part of what makes 2.0 better is that it is a lot meatier than its predecessors. There are seven applications modules supplied on one floppy disk for the QX-16 (or three floppy disks for the QX-10). The applications include a text editor, spreadsheet, electronic communications, address book, business graphics, date book, and card file. There's also a nice little program called Matrix that lets you design your own fonts. And two other impressive Valdocs programs, Valdraw and Valpaint, will be offered at additional cost. These optional programs, which work with a mouse, let you draw, zoom, and paint pixel by pixel.



Valpaint (top) and Valdraw screens.

Rising Star, the company responsible for Valdocs, says it tried to make each Valdocs 2.0 application as good as anything else in its field. It was an impossible goal, and one that Rising Star didn't attain. However, the company did take a giant step toward

to Southern California. Each programmer was assigned his piece and he worked until it was perfected. Notes, comments, and code were sent to several Rising Star on-line bulletin boards for peer review. All code was also sent to a computer bulletin board in New Jersey where Rising Star Executive Vice President Roger Amidon—who coordinated the entire effort—reviewed it, made certain it worked with other modules, and ordered revisions or rewrites.

The concept remained the same throughout—to create a state-of-the-art integrated software package that anybody could use. In its final version, Valdocs 2.0 took over 650K bytes of disk storage. The system contained 68K bytes of help files and more than 300 menus. (Not even Rutkowski could establish exactly how many menus there really are.)

By the time it reached final testing, Valdocs 2.0 was, in Rutkowski's opinion, a better program than any other he had ever seen. It was better than anything on the Macintosh, which had been introduced during the development of 2.0, because it didn't depend entirely on the mouse, which was, according to Rutkowski, a fine input device for limited circumstances, but not a replacement for the keyboard. (Anyway, Rutkowski's new Valdocs uses a mouse for what mice do best—paint and draw programs.)

Valdocs was better than Lotus Development's 1-2-3, not because it was more powerful, but because it was usable by people who weren't spreadsheet geniuses. "I have a spreadsheet that people who have never used a spreadsheet can sit down and use," Rutkowski said.

It was better than Wordstar because it was a what-you-see-is-what-you-get text editor. If you wanted something in boldface, you pushed the Bold key and it showed boldface on the screen. It was, in Rutkowski's eyes, state of the art. Period.

"We have set the standard that all others will have to match," Rutkowski said. "Especially in ease of use. I don't think there's anything out there that's better. We're talking magic."

And yet, Rutkowski admitted, Valdocs 2.0 wasn't perfect. While the text editor did give you on-screen bold, italics, three sizes of type, and superscript and

CONTINUED ON PAGE 167

keys are designed. There are keys to delete text backwards and forwards by character, word, or line, as well as keys for Bold, Ital, Size (to change the type size), and Style (superscript or subscript).

The major criticism of earlier versions of the Valdocs editor was that it was slow. That remains an issue in 2.0. Although Rising Star has speeded up input (to a potential 400 words per minute), it has not brought some word-processing functions up to the speed one might expect. If you want to go from the top to the bottom of a Valdocs file, plan on taking about two seconds for each page of text. Block moves are also cumbersome, although they are significantly faster than earlier versions of Valdocs. Because the editor is menu driven, moving a block of text takes a dozen keystrokes.

A key labeled Calc moves you into the Valdocs spreadsheet, which can handle up to 702 columns and 999 rows. You can divide the screen into as many as four windows for a better look at varied parts of a single spreadsheet, and the screen will display either 80 or 128 columns as you prefer. The spreadsheet works with virtual memory, meaning it uses disk storage rather than RAM only, and there is a trade-off—potential size versus speed. Rising Star claims its program is the fastest virtual-memory spreadsheet in the world, which may well be true. But the Valdocs spreadsheet is much slower than RAM-based spreadsheets such as Visicalc.

The Mail key gives you an electronic address book and various communications functions. This program comes closest to state-of-the-art in Valdocs 2.0. The communications program interfaces with the address book, allowing automatic dialing and log-on. In addition to standard communications protocols, Mail supports batch transmissions. It can instantly convert Valdocs files to American National Standard Code for Information Interchange (ASCII) for fast uploading. One wonderful feature is background auto-answer, which answers even if the machine is running another program module, alerting you to press the Mail key to respond to your call.

The Draw key takes you into the business graphics module, which allows you to create pie, bar, line, and scientific charts. All but the pie chart support eight different sets of data, creating overlaid graphs. All charts can be scaled in size.

Through the Menu key, you can access the card-file-like database. Each card can have 14 data fields of up to 56 characters. You can define both primary and secondary sort fields, and an index function lets you include the same card in several databases.

The sheer size of 2.0 makes a hard disk a must if the software is to be used in a business environment. Otherwise, you have to swap floppy disks when you want to move from some applications to others. That is annoying and confusing. A solution to that problem—proposed by Valdocs designer Rutkowski—is to delete from your working-applications disk those Valdocs modules that you don't often use (including help files as you no longer need them), refilling the disk with only those modules you want. It is a reasonable kludge, but it is not the ultimate solution.

Neither is Valdocs 2.0 the ultimate solution to everybody's software needs. Chris Rutkowski and his brethren at Rising Star have undertaken a huge project. They have grand dreams, and they are closing in on them step by step. But Valdocs is still imperfect. It needs integration. It still needs a faster text editor. And, although Rutkowski vehemently disagrees, it probably needs a microprocessor more powerful than the 8-bit Z80 give it the muscle to do the job right.□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A year's worth of reports, plans, schedules, charts, graphs, files, facts and figures and it could all be lost in the blink of an eye.

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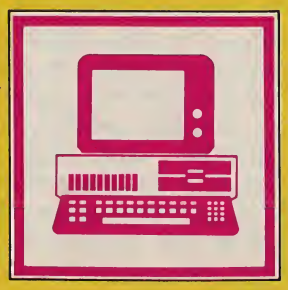
SPECIAL REPORT

High tech without the high price

LOW-COST COMPUTING



PART ONE:
Best Buys in Computers

PART TWO:
Low-Cost Peripherals

PART THREE:
Free Software

If you think personal computing has to cost a small fortune—if you believe that high tech inevitably means high price—then you're in for a pleasant surprise. When you know where to look, you can buy professional-quality telecommunications or word-processing software for just $35, or a sophisticated computer touch-pad system (hardware *and* software) for under $100, or a top-rated modem for under $70. Or you can even buy a complete computer system, including a central processor, a typewriter-style keyboard, a disk drive, some software, and a decent printer, all for less than $700.

This is a small sampling of some of the very best buys in personal computing today; products that prove you can cut the costs of computing right to the bone, without having to sacrifice quality.

But it's not always easy to find "best buys" in computer systems, peripherals, and software. In fact, some low-cost products are of such poor quality and limited usefulness that they're no bargain at all. That's why we've asked three knowledgeable authors to share their expertise with us and show how it's possible to combine high quality and low prices to get the best return on your computing investment.

If you're looking for solid value in a small computer for your personal use, "Best Buys in Computers" by Associate Editor Tom McMillan examines the strengths and weaknesses of four different machines with one shared trait: each can be the heart of a genuinely useful, full-fledged home computing system for a total price of under $700.

If you already have a computer, the next two articles show how to expand your system's usefulness without breaking your budget. In "Low-Cost Peripherals," New Products Editor John Edwards discusses outstanding values in add-on devices ranging from light pens and voice synthesizers to printer spoolers and multifunction cards.

Finally, in "Free Software," noted author Alfred Glossbrenner shows how to tap the rich vein of public-domain software. Using specific examples, he discusses what's available, examines its capabilities, and demonstrates how the savings can add up to hundreds of dollars. No matter what equipment you own or where you live, there's free software available for you.

—Frederic S. Langa

Frederic S. Langa is the Assistant Managing Editor of *Popular Computing*.

Symbols: Varlie Lewis

BEST BUYS IN COMPUTERS

PART  ONE

You needn't break the bank to get a respectable home system

by Tom McMillan

If the home computer revolution hasn't happened quite as quickly as some experts predicted, it may be in part because computers are very expensive. Today it's easy to spend as much on a personal computer as on a good used car, and that's an investment few of us can make lightly.

But bargains exist. In fact, for less than $700, you can get a respectable home computer system complete with a mass-storage device (such as a floppy-disk drive) and an inexpensive printer. True, such a system isn't going to run the most advanced software, crunch numbers at astonishing speeds, or make it easy to write a 100,000-word novel, but it will open the doors to computing.

At the same time, though, bargain hunters must beware. Snapping up a discontinued model for $100 will save you money in the short term, but it may also put you in line for plenty of frustration when you begin to look for up-to-date software, reliable service from the manufacturer, and support from user's groups, book and magazine publishers, and the computing community at large. As with so many purchases, the best buy is not necessarily the least expensive product.

What are the best buys in home computers? Four likely candidates are Coleco's Adam, Radio Shack's TRS-80 Color Computer 2, the Commodore 64, and the Atari 800XL. Any one of these successful machines can be the heart of a complete system costing no more than $700, giving you all you need for basic home uses such as education, programming, telecommunications, games, and limited word-processing and financial management. Indeed, it could be years before you'll outgrow the capabilities of one of these machines.

Before looking at each in turn, let's examine what they have in common. Each includes 64K bytes of user memory addressed via an 8-bit processor, which is adequate for most uses—short of full-fledged business applications that demand high-speed and copious data-handling capabilities. Each is easy to connect to your television set and displays information in a format designed for such a setup. (No special monitors are needed.) All of the four computers are equipped with respectable full-stroke, typewriter-style keyboards.

As your expertise and interests grow, you can expand these machines through the addition of telephone modems, printers, light pens, graphics tablets, and other peripherals. And each machine comes with its own version of the BASIC programming language, enabling you to type in program listings from magazines and become versed in programming yourself. Finally, all of these machines (with the partial exception of Adam, which is still the new kid on the block) have sold well enough to engender plenty of helpful books, user's groups, and other sources of support and information. Beyond these commonalities, though, each of these home computers has certain advantages that make it especially suited to particular uses.

Coleco's Adam

Compared to the long-lived Radio Shack, Commodore, and Atari computers, Coleco Industries' Adam is still wet behind the ears, having been on the market for less than two years. Nonetheless, Adam's biggest selling point is easy to pin down: it is not just a computer, but a complete system all in one box. In the same way that some stereo manufacturers market complete systems that include matched turntables, tuners, amps, and speakers, Coleco bundles the basic Adam computer with a pair of joysticks, a mass-storage device for programs and data, some useful software, and, most notable, a letter-quality printer. Thus, Adam's $700 price tag is not out of line—even though you can buy a Commodore or Atari for less than $200, by the time you add a printer and mass-storage device, you're going to be in the same budgetary ballpark.

Adam's "complete system" marketing concept has a lot to be said for it, but it does carry a built-in limitation, at least in the way Coleco has implemented it. Because the various components of the system work together through a nonstandard interface known as Adamnet, you cannot add peripheral devices made by other manufacturers. So when you expand the system,

you have to use Coleco's modem and floppy-disk drive.

Adam employs what the company calls a digital tape pack for mass storage of programs and data. While the digital tape pack is not as fast or as convenient as a floppy-disk drive, it is an advance over the standard cassette recorders that represent the low end of mass-storage devices. The chief disadvantage of the digital tape pack, however, is the difficulty of backing up or copying the information stored on tape; this is the fault of Adam's operating system, which inexplicably does not provide a Copy command.

Adam's letter-quality printer is also slow, but unless you're the impatient type, it should suffice. Moreover, you're not likely to run into the all-too-common difficulty of getting your computer to communicate with your printer because all of Adam's components have been designed to be compatible. The biggest problem is that the printer includes the power supply for the entire system—if your printer dies so does everything else.

Coleco's Adam

In addition to the printer, another feature that makes Adam especially suited to working with words is its keyboard. Dedicated keys such as Insert, Delete, Move/Copy, and Store/Get provide quick access to word-processing functions. Also, Adam's keyboard is detached from the computer, so that you can arrange a comfortable typing position.

Adam's final word-processing bonus is Smartwriter, a word-processing program that's built into the machine. Hitting a single key starts the program—nothing to load, call up, or hunt for. Although it's not a professional-quality word processor, Smartwriter does offer features such as text searching, block highlighting, and undo. Smartwriter should be all you need for writing letters, memos, school papers, and the like.

Adam's system also includes SmartBASIC, a version of the popular programming language that closely resembles Apple's Applesoft BASIC. Indeed, you can type in many programs written for Apple computers and run them without modification on Adam.

In addition to handling word processing and programming, Adam is a good game machine. You can plug in a standard Colecovision game cartridge and get the same action you'd find on a Colecovision video-game system. The game controllers handle fast play well, and you can use one as a numeric-entry keypad and an alternative to cursor-control keys.

Adam does have a few drawbacks, though. When first introduced, the system almost immediately developed a reputation for unreliability—many of the early Adams simply did not work as advertised. Coleco is adamant about having corrected these reliability problems. Still, such a reputation is not easy to shake and accounts for Adam's somewhat disappointing record in the market.

Another ramification of Adam's shaky start is the limited amount of software available for the computer—you simply do not have the broad selection that you'll find in the Commodore or Atari libraries. Software publishers have been hesitant to commit to Adam's unique tape format, especially when the future of the newly released product began to look cloudy. Coleco has coaxed some of these publishers back on the bandwagon with its recent assurances of reliability, but more software publishers must follow to ensure the continued viability of Adam.

Adam certainly deserves the attention of anyone shopping for an inexpensive home computer. If you're one who appreciates plug-in-and-go convenience, the system was designed with you in mind. Also, if you're keen on learning about word processing, Adam has a lot to offer. But before you make a decision, let's look at some other contenders.

Radio Shack Color Computer

The name Radio Shack has been at the heart of the microcomputer revolution from the very start, and while the company hasn't produced what you'd call a blockbuster product, it has turned out a succession of highly regarded, well-engineered machines. Even at the bottom end of the line, the Radio Shack Color Computer 2 is no exception.

Tom McMillan is an associate editor of *Popular Computing*.

Illustrations by Gene Greif

Like the other three machines covered here, the Color Computer is low in price and offers capabilities suited to the range of home uses, whether it be word processing, action games, education, or budget management. The Color Computer is available in two very inexpensive 16K-byte versions, but I recommend the 64K-byte model, which is in the same class as the other computers covered here. This top-of-the-line Color Computer lists for $260 (although it's occasionally on sale for around $200), and a floppy-disk drive adds roughly $350 to the system's cost. Further equipped with an inexpensive printer, a Color Computer system comparable to the Adam ends up costing about the same.

Several factors set the Color Computer apart from its competition, however. First of all, unlike Adam, Atari, and Commodore, the Color Computer is sold only by authorized Radio Shack dealers. In terms of service and support after purchase, the differences between a Radio Shack Computer Center and a mass merchandiser that sells the other low-cost machines can be staggering. If you value insurance against service hassles, you'll appreciate the support Radio Shack offers.

Moreover, that same Radio Shack dealer also carries the complete range of Color Computer software. Although the Color Computer's software catalog won't compete with Atari's or Commodore's, it's far more extensive than Adam's. Available programs are concentrated in areas of special interest to home users: word processing, home budgeting, games, and especially education. Many Color Computer programs are aimed at youngsters—these combine the fun and graphics of games with some thoughtful practice in basic skills—and many Color Computers have been purchased by schools for use in the classroom.

The Color Computer eclipses Adam in terms of expandability. The machine has a standard serial interface, and its tenure on the market has led to a wide assortment of peripherals designed especially for the machine. Modems, joysticks and other game controllers, light pens, and even a sophisticated graphics tablet are all readily available and easily hooked up to the machine. You can even use a serial peripheral that was not designed for the Color Computer, but you'll need an adapter cable to accommodate the machine's nonstandard connector.

If one of the reasons you're in the market for a home computer is to gain that elusive skill known as computer literacy, the Color Computer is a good choice for a couple of reasons. The machine comes with Extended Color BASIC, which is especially suitable for graphics programming—an application that the Color Computer, with its three graphics modes, handles well. Moreover, the Color Computer comes with several outstanding manuals, one of which is a BASIC programming tutorial. Without any additional investment, you can get off to a fine start on the road to programming fluency.

In the same vein, Radio Shack offers an optional operating system known as OS-9. Actually a version of the increasingly popular Unix system, OS-9 gives you the opportunity to become familiar with sophisticated concepts such as multitasking and multiuser implementations. The Color Computer's ability to handle this system stems from its advanced (for a home computer) processor, the 6809E. This little gem can process 16 bits internally at a time, instead of 8 bits at a time as with Adam, Commodore 64, or Atari 800XL.

Thus the Color Computer shines for several reasons. Its dealer support and service are second to none. The machine is backed by a strong software library, it is readily expandable, features a good keyboard, and is solidly engineered overall.

The Commodore 64

Back in the May 1983 issue of *Popular Computing*, our reviewer suggested that the new home computer known as the Commodore 64 could, if it received support from software publishers, become a hit. Well, the machine received that software support, and it would be an understatement to say that it has been a hit—the Commodore 64 is the single most successful computer ever sold. The combination of low price, powerful capabilities, and aggressive marketing has won the machine

a place in millions of homes.

For today's potential buyer, the biggest thing the 64 has going for it is a tremendous software library. Much of this software is brand new and represents the state of the art in games, educational programs, home budgeting, and the like. If you're looking for a computer that will give you access to the widest possible range of applications, the Commodore's software base makes it the logical choice.

But the sheer numbers of Commodore users have stimulated more than the software industry. Book publishers have seized on the machine's popularity too, creating a vast collection of tomes ranging from the trivial to the technical and making the Commodore perhaps the best-documented machine of all. Similarly, legions of Commodore user's groups have sprung up—new owners living near a metropolitan area can find plenty of friendly support from these organizations. The 64's large user base has also generated extensive libraries of public-domain software available for free or for a nominal fee.

The Commodore 64

Like the Color Computer and the Atari, a Commodore 64 needs a floppy-disk drive to perform well. Commodore's drive is notoriously slow but still beats the socks off using a cassette recorder. And like the drives for the Color Computer and Atari, a Commodore disk drive costs more than the machine itself. You're likely to find a 64 on sale for less than $200, but the drive is going to set you back another $350 or so. Beyond this basic peripheral, you'll find that the Commodore is further supported by a wide range of other devices such as modems, printers, light pens, and the like.

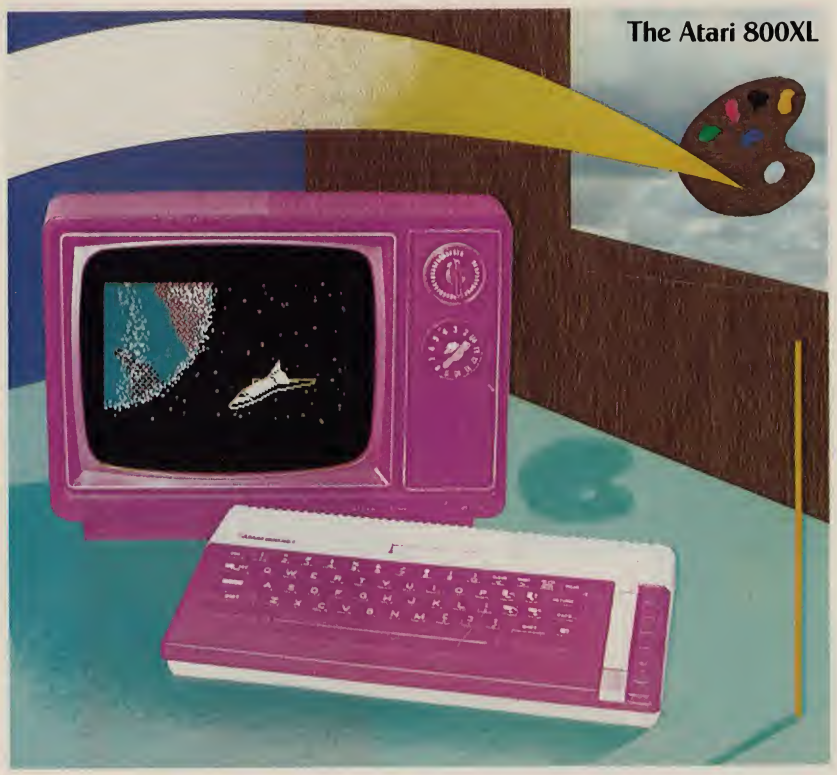
But it's not just the right price and strong marketing that have put the 64 where it is today—the machine has some notable features that make it rewarding to work with. The keyboard, although not the best of the bunch we're considering here, is certainly adequate (the lack of a Tab key and its reliance on only two cursor-control keys make it less than ideal for word processing, however). The machine comes with its own version of the popular Microsoft BASIC programming language. For graphics programmers and game enthusiasts, the Commodore has two graphics modes featuring sprites, which are easily programmed blocks that move independently of the background scene. And those interested in music will appreciate the machine's three-voice sound generator, which is now supported by a number of excellent programs. In short, the Commodore 64 offers almost everything one could want in a home computer. But before you rush out to buy one, there's another tried-and-true performer you should consider.

The Atari 800XL

Perhaps the Commodore's strongest competitor, the Atari 800XL also has users galore. The Atari carries many of the same bonuses—an extensive list of available software; plenty of books, programming tutorials, and other reference materials; and lots of support in terms of user's groups and other organizations. And like the Commodore, the Atari 800XL generally sells for $200. Only an occasional lack of availability and a recent shake-up within the company have kept the Atari from achieving the same phenomenal sales.

While the first thing most pundits note about the Commodore 64 is its extensive library of fine software, the immediate response to questions about the Atari 800XL is "Great graphics!" It's not the machine's screen resolution that sets it apart—all the computers considered here display from 250 to 320 pixels horizontally and 190 to 200 vertically. What does make the 800XL different are the number of available colors and the variety of graphics modes. You can work with 256 different colors (as compared to 16 on the Commodore 64, 9 on the Color Computer, and 16 on Coleco's Adam), and you have 11 graphics modes of various resolutions and foreground/background configurations (the 64 offers two graphics modes, the Color Computer three, and Adam one).

In addition to the graphics modes, the Atari also offers five different text modes and a four-voice sound generator, making it a flexible machine for the programmer. Because many of the 800XL's more advanced graphics modes have not been tapped by commercial software programmers (it's easier to translate programs



The Atari 800XL

to other machines if they're written using the more basic modes), you can often achieve effects on your own that outdo anything you'll see on most commercial programs. Moreover, the Atari's outstanding graphics have spawned many peripherals, ranging from a variety of game controllers to sophisticated light pens and graphics tablets.

The Atari 800XL is also an excellent game machine, whether you choose from the wide variety of commercially available programs or get into programming your own with Atari BASIC, which is especially equipped to handle the machine's graphics virtuosity. Player-missles—programmable blocks similar to the Commodore's sprites—are designed to simplify the development of arcade-type games. And the number of books devoted to game and graphics programming on the Atari could fuel years of study. To put it in a nutshell, if games and graphics programming appeal to you, it's hard to beat the Atari 800XL at any price.

But this is not to suggest that the Atari is a one-tune band. The Atari Writer word-processing program, supported by the machine's good keyboard and a $350 letter-quality printer from Atari, make it a fine choice for home word processing. Moreover, a simple interface cable makes it easy to connect the 800XL to a wide variety of peripherals from other manufacturers. And the ATR8000 add-on microprocessor board (from SWP Microcomputer Products, Suite 125, 2500 East Randol Mill Rd., Arlington, TX 76011) lets you run many CP/M and MS-DOS programs, something none of the other machines described here can do. Thus while the Commodore 64 may have the edge in sheer numbers of good programs, the Atari does have some unique features.

The only real question mark about the Atari is where the company is headed. After a rough year in 1984, though, Atari seems to be getting back on an even keel, and a spokesman for the company insists that no matter what happens in the future, Atari will continue to support the 800XL by making sure that any new software developed for 8-bit machines will run on all older computers. And if the company does come out with some new machines, as seems likely, the 800XL will become available at bargain-basement prices.

The Bottom Line

If your bottom line is a literal dollars-and-cents consideration, simply shop around—you won't go wrong with any one of the four home computers we've covered here. Remember, though, to compare equivalent systems. A disk drive is recommended for the Color Computer 2, the Atari, and the Commodore; Adam's digital tape pack, which comes as a part of the bundled system, is an acceptable, though slower, alternative. Sooner or later you're going to want a printer (you'll want one right away if word processing is to be one of your primary applications), and you'll have to weigh the choice of getting one with the computer or putting off the purchase.

But if you can be specific about how you plan to use your new home computer, then we can offer some more pointed recommendations:

- Adam's chief advantages are two: the convenience of a complete system that's easy to set up, and a good word-processing program, built into the machine, that's supported by an excellent keyboard and a letter-quality printer.
- The Radio Shack Color Computer offers the best manufacturer support, an excellent version of BASIC, and the option of an advanced operating system; somewhat paradoxically, its educational software and acceptance by schools make it a top choice for young children.
- The Commodore 64, given its superior collection of software and assortment of peripherals, takes the cake as far as all-around versatility goes.
- The Atari 800XL rivals the Commodore's versatility and distinguishes itself with the best graphics of any 8-bit computer.

So while the choice is yours, the time is now. With machines like the four we've looked at here becoming available at bargain prices, there's never been a better time to get into computing on a shoestring. □

THE NCR PC IS COMPATIBLE WITH PEOPLE, TOO.

Getting along with all kinds of people is one of the most endearing qualities of the NCR PC4.

It gets along with bosses, secretaries, accountants, engineers, lawyers, everybody.

Even first-timers take a liking to this computer the moment they take it out of the box.

Perhaps its good looks have a lot to do with this. But its beauty is more than skin deep.

Its smart, integrated cabinet takes up precious little space on your desk.

There are no complicated wires or clumsy boxes to set up. All you have to do is plug it in.

The keyboard is the same familiar layout your fingers know and love. Plus a couple of nice touches. Like separate cursor keys and a separate numeric keypad to make it easier to work with programs that have long lists and lots of numbers.

The NCR PC even comes with two special self-teaching programs that will have you computing in a matter of minutes. NCR PAL shows you how to use the computer itself. NCR TUTOR introduces you to word processing, spreadsheets and other popular business programs.

And if you get lost along the way, there's a built-in HELP command you type in to get you back on track.

Add all this up and you start to see why the NCR PC is so compatible with people.

Of course, it's also compatible with thousands of programs available at computer stores everywhere.

And it's compatible with industry standard hardware. Which means you can add on all sorts of helpful accessories. Like a printer, a modem for electronic mail, a mouse for even easier operation and all the memory you need—up to 640K.

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Just ask for the computer everybody gets along with.

For the name of your nearest dealer, call toll-free: 1-800-544-3333. In Nebraska call: 1-800-343-4300.

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NCR

A BETTER PERSONAL COMPUTER. IT'S EXACTLY WHAT YOU'D EXPECT FROM NCR.

SPECIAL REPORT by John Edwards

LOW-COST PERIPHERALS

PART TWO

Twenty best buys in add-on hardware

Quality and low price are concepts that seem diametrically opposed. "You get what you pay for," the adage goes, and most of us shop for computer peripherals with that thought in mind.

But in the personal computer marketplace, price isn't necessarily a measure of quality (as anyone who paid $1000 for an Atari 400 in 1981, only to see the price fall to under $400 in less than a year, will readily testify). The trick, of course, is to find products that feature both better-than-average prices *and* better-than-average quality.

As New Products editor for *Popular Computing*, I've seen a number of computer peripherals that do just that—offer exceptional value for the money. These devices are not necessarily the lowest-priced products in their respective categories, but I still believe they all qualify as legitimate best buys.

► STAR GEMINI-10X is an 80-column dot-matrix printer that features an impressive print speed of 120 characters per second, a 9 by 9 matrix density, and dot-addressable graphics. The unit features emphasized and double-strike print modes, three pitch settings, and italic, graphic, and special characters. Users can also download their own characters into the printer's internal random-access memory. The Gemini-10X accepts fanfold, roll, and cut-sheet paper. Other standard features include a Centronics-type parallel interface, a self-test mode, and an 816-character print buffer. Options consist of an RS-232C serial interface, a tractor-feed mechanism, and 4K- and 8K-byte print buffers. The Star Gemini-10X is often heavily discounted, so shop around.

Star Micronics Inc., Computer Peripherals Division, Suite 311, 88 Washington St., Dedham, MA 02026; $399.

► OKIDATA MICROLINE 92 is a dot-matrix printer that offers a compromise between printing quality and speed. In its correspondence-quality setting, the printer generates documents at a rate of 40 characters per se-

John Edwards is a contributing editor of *Popular Computing*.

A potpourri of high-quality, low-cost peripherals and accessories: (Top row, left to right) *Chip-Tote carrying case; Signalman Mark XII modem (telephone not included); Think Jet ink-jet printer; HAWS home weather station.* (Second row) *Volksmodem; Strobe M260 color plotter; Optomouse cursor-control device; Microspooler printer buffer.* (Third row) *Brother HR-15 daisy-wheel printer; Echo+ speech synthesizer board; Koalapad graphics tablet; Omni-reader optical text reader.* (Bottom row) *Ram+6 multifunction card; Wire Cube electrical surge protector; Star Gemini-10X dot-matrix printer; and Hard-Disk removable mass data-storage system. Not shown, but mentioned in the text: Magellan Light Pen; Sears Model 4084 monitor/color TV; HP Laser Jet printer; and the Okidata Microline 92 dot-matrix printer.*

cond. The Microline 92 also provides data processing and enhanced modes with printing speeds of 160 and 80 characters per second, respectively.

The 80-column unit provides underlining, super- and subscripts, horizontal and vertical tabs, six pitch settings, proportional spacing, and dot-addressable graphics. Characters are formed from a 9 by 9 matrix for data processing and enhanced modes or a very nice 9 by 17 matrix for correspondence-quality print.

Standard equipment consists of a Centronics-compatible parallel or RS-232C serial interface, a 96-character ASCII set, and a bidirectional, logic-seeking print head. Optional items include a tractor-feed mechanism, and high-speed serial (to 19.2K bits per second) and IEEE-488 interfaces. All in all, I think this is a good printer value for people who need a unit that handles both draft and finished documents.

Okidata Corp., 532 Fellowship Rd., Mt. Laurel, NJ 08054; $699.

Photograph by Mike Blake

► BROTHER HR-15 is one of the new generation of high-quality, low-cost daisy-wheel printers. While the unit's print speed (13 characters per second) is relatively slow when compared to similarly priced dot-matrix units, the Brother's letter-quality output is virtually equivalent to printers costing twice as much.

The unit features boldfacing, shadow-printing, proportional spacing, super- and subscripts, and three pitch modes. The unit incorporates both Centronics-type parallel and RS-232C interfaces, as well as a 2K-byte print buffer, Diablo 1610/1620 compatibility, interchangeable printwheels, and an extensive assortment of programmable operating modes. Options include a plug-in keyboard, a tractor-feed mechanism, and a cut-sheet feeder.

The Brother's weak spot is its documentation, which is almost laughable at times. Consider the following:

"Kindly note that the amendments contained in the attached pages became effective after printing of the Instruction Manual by reason of the version-up improvement made to our daisy-wheel printer."

Still, if you're adept at deciphering half-baked Japanese translations, the Brother HR-15 is a good buy.

Brother International Corp., 8 Corporate Pl., Piscataway, NJ 08854; $599.

► THINK JET is an ink-jet printer that provides a high-quality and virtually noise-free output. The unit features a print speed of 150 characters per second, Epson compatibility, eight character sets, and the ability to work with Apple, IBM, Radio Shack, and Hewlett-Packard computers.

Unlike daisy-wheel or dot-matrix units, ink-jet printers don't actually strike an image into a paper's surface. Instead, a nozzle, controlled by a series of electrical impulses, is used to shape and spray ink droplets onto the page. This results in whisper-quiet operation and a greatly reduced chance of mechanical failure. Furthermore, Think Jet users never have to bother with messy ribbons (an inexpensive, disposable ink reservoir is used). The only drawback is the fact that, for best visual quality, you must use special paper sold by Ink Jet's manufacturer (2000 sheets will run you about $60). Still, considering the advantages the printer offers, that's a relatively small price to pay.

Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94304; $495.

► HP LASER JET takes laser printer prices out of the stratosphere and lowers them to a more affordable level—to the troposphere, at least. With a list price of $3495, this printer won't find a place in your average high-tech American home, but it does offer a high-quality, high-speed alternative for many businesses.

The Laser Jet's specifications are impressive. The unit prints documents at speeds of up to eight pages per minute (300 characters per second), offers a maximum resolution of 300 dots per inch, and lets you mix several type styles on a single page. The printer uses both laser and photocopying techniques to generate documents. During printing, a miniature laser etches characters onto a light-sensitive drum. The drum then applies a toner chemical to a sheet of paper, producing the final document. The characters produced by the Laser Jet are of a very high quality—virtually equal to those generated by daisy-wheel printers.

The Laser Jet accepts both letter- and legal-size bond paper. The unit features a quiet 55-decibel noise level and disposable toner cartridges. It works with Hewlett-Packard's HP 150 and IBM PC and PC-compatible systems.

Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94304; $3495.

► THE MICROSPOOLER printer buffer frees your computer during lengthy printout sessions. Featuring 64K bytes of random-access memory, an LED status indicator, copy/pause and reset buttons, and a single-sheet feed/pause mode, the unit works with virtually any computer. Since the Microspooler is available with a variety of serial and parallel interface combinations, it can interconnect normally incompatible printers and computers.

In addition to storing data for a printer, the device also supports a modem, enabling users to download and save on-line information without tying up a computer.

Consolink Corp., 1275 Sherman Dr., Longmont, CO 80501; $199.

► STROBE M260 is an 8-color plotter that brings business-quality graphics within reach of the average computer user. The M260 boasts a plotting area of 8 by 10¾ inches, a pen speed of 3 inches per second, and resolution and repeatability factors of 0.002 inch.

An intelligent RS-232C interface provides uppercase and lowercase American, English, French, German, Scandinavian, Spanish, and Italian character sets that can be mixed during output and plotted proportionally.

In most areas, the M260 compares favorably with plotters costing much more. For example, the Strobe plotter matches the speed, resolution, and repeatability rates of Houston Instrument's CPS-20 ($3995). The M260 is compatible with RS-232C-equipped computers using Apple DOS 3.3, MS-DOS, TRSDOS, or CP/M.

Strobe Inc., 897-5A Independence Ave., Mountain View, CA 94043; $995.

► SEARS MODEL 4084 is a combination monitor/color TV that should be of particular interest to home computer users who don't want to spring for a separate, dedicated video display.

The Model 4084 boasts a 13-inch monitor-grade picture, RGB (red-green-blue) and composite video inputs, a green display switch, and screen compression and horizontal centering controls. In the RGB mode, the compression feature can squeeze displayed material to 70 percent of its original height, resulting in improved clarity. The set also features a built-in VHF/UHF tuner, push-button channel selection, and audio output jacks.

Sears, Roebuck, and Co., Dept. 703, 40-15, Sears Tower, Chicago, IL 60684; $350.

What's the best recommendation you can make when you're asked about business graphics?

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The technical standards of the HP 7475A have no equal for producing quality graphics. With a resolution of one-thousandth-of-an-inch, curved lines are smooth, not jagged, and straight lines are *consistently* straight. Its exceptional repeatability (the ability of a pen to return *precisely* to a given point) assures that intersecting lines and circular shapes will meet *exactly.*

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The HP 7475A quickly "makes friends" with most of the personal computers you may already have in your office, including IBM®, Apple™, and Compaq™—as well as a host of HP computers. You even have a choice of many off-the-shelf software packages, such as Lotus 1-2-3™ and Symphony™, that give you "first-day" productivity with the HP 7475A.

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While most professional business applications will be satisfied with standard 8½ x 11″ paper or transparencies, the HP 7475A adds the capability of plotting on larger 11 x 17″ media, too.

The cost? Surprisingly affordable

The HP 7475A Business Professional Plotter is an amazingly affordable $1895. When you consider the high cost of having your graphics prepared by an outside service, you'll find the return on your investment is almost immediate.

1-2-3 and Symphony are trademarks of Lotus Development Corporation

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For the "business on a budget," you may also want a look at our 2-pen Personal Computer Plotter, the HP 7470A. Its low-cost (only $1095) is as remarkable as the quality of its plots. With many of the same features as the HP 7475A, the HP 7470A plots on media up to 8½ x 11!″ It stores and caps two-pens, and you can easily change the pens for multi-color plotting.

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Phone Number ( ) _____

My computer is _____

Send to: Hewlett-Packard, 16399 W. Bernardo Drive,
San Diego, CA 92127-1899
Attn: Marketing Communications

11404 PC1

► VOLKSMODEM is a quality 300-baud modem at a bargain-basement price. The direct-connect unit works with any RS-232C-equipped computer and features answer and originate, full- and half-duplex, and data and talk modes. According to its manufacturer, the unit works with most popular telecommunications programs.

Anchor Automation, 6913 Valjean Ave., Van Nuys, CA 91406; $80, a required computer-to-modem cable is priced at $13.

► SIGNALMAN MARK XII is a low-cost, high-speed modem. This direct-connect, 300/1200-baud unit offers auto-dial/auto-answer functions, four front-panel status indicator lights, and a built-in 12-volt power supply.

"As New Products Editor, I believe all these devices qualify as legitimate best buys."

The Mark XII supports 28 keyboard-to-modem commands and can be programmed to perform a variety of sophisticated tasks, including ring counting and speed dialing. A 30-page manual helps you master the unit's functions and acquire some fundamental modem programming skills. Like the Volksmodem, the Mark XII will support most telecommunications programs.

Anchor Automation, 6913 Valjean Ave., Van Nuys, CA 91406; $399.

► OPTOMOUSE, a cursor-control mouse device, proves that you don't have to purchase an Apple Macintosh or Lisa to take advantage of mouse technology.

An internal software driver enables Optomouse to work with many popular application programs. The unit's on-board microprocessor can be programmed to generate any combination of ASCII codes, allowing users to control up to four program functions from the device's two top-mounted keys.

Optomouse installs into any computer with an RS-232C or TTL interface. The unit features selectable data-transfer rates ranging from 110 to 9600 bits per second. For programmers, Optomouse offers a monitor mode that displays the unit's directional input as a stream of arrows, allowing a preview and providing confirmation of Optomouse's operation. Directly addressable input and output ports let you program the mouse's direction settings, sensitivity, and control-code output.

USI Computer Products, 71 Park Lane, Brisbane, CA 94005; $299.

► HAWS (Home Automatic Weather Station) is an offbeat product with little practical value unless you happen to be a farmer or TV weather forecaster. It is, however, a lot of fun to use.

The system provides much of the same weather data generated by costly, dedicated meteorological computers. Indeed, the system is manufactured by Vaisala, a Finland-based company that supplies weather forecasting instruments to many European governments.

HAWS includes both hardware and software modules. The system's hardware component consists of temperature, humidity, and wind sensors that are mounted outside the home. The HAWS software, which includes 10 tape- and disk-based programs, offers continuously updated displays of temperature, humidity, dew point, and barometric pressure. Other programs provide weather forecasts, comfort ratings, cloud altitudes, and historical weather data.

HAWS is currently available for Commodore 64 and VIC-20 computers. According to Bennett Lavine, a Vaisala spokesman, a version for RS-232C-based computers is "currently in the works."

Vaisala Inc., 2 Tower Office Park, Woburn, MA 01801; $200.

► ECHO+ SPEECH SYNTHESIZER offers Apple II and IIe users state-of-the-art speech synthesis at an affordable price. The Echo+ offers natural-style female and robot-type voices, stereo music, and sound effects.

The Echo+'s most distinctive feature is its natural-sounding output that draws from a fixed vocabulary of over 700 commonly used English words. Unlike phoneme-based systems that synthesize speech from word sounds, Echo+ generates words that are encoded into the synthesizer in their entirety. The words are supplied on a disk and easily added to any BASIC program. The Echo+ also features a phoneme-based text-to-speech program that gives the Apple an unlimited vocabulary. This program allows any text typed onto the computer's video display to be spoken.

The Echo+ follows over 400 English language and pronunciation rules. Simple commands are used to control the rate of speech (regular or fast), output mode (spoken, printed to the screen, or both), and how the text is read (word by word, letter by letter, or with all, most, or some punctuation spoken).

For the musically inclined, the Echo+ provides output on six channels. Accompanying software lets you produce a wide variety of stereo sounds that can be added to BASIC programs. The system is compatible with Electronic Arts' Music Construction Set.

Street Electronics Corp., 1140 Mark Ave., Carpinteria, CA 93013; $150.

► KOALAPAD is without question the leader among all currently available low-cost graphics tablets. It also happens to be the best low-cost graphics tablet. Available in versions for nearly all computers, Koalapad frees you from your keyboard, letting you input data or draw images on your video display with the touch of a finger.

Unlike some competing tablets, Koalapad is easy to use. The pad surface is firm, yet sensitive enough to reliably respond to user input. In addition to serving as a graphics pad or keyboard substitute, the device can also work as a game controller. Your fingertip takes the place of a joystick or paddle control and a pair of firing buttons let you launch missiles, bullets, or whatever.

A highlight of the Koalapad package is its Micro Il-

CONTINUED ON PAGE 179

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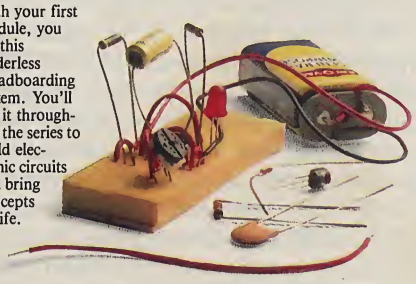

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SPECIAL REPORT

FREE SOFTWARE

PART  THREE

How to get professional-quality software for pin-money prices

by Alfred Glossbrenner

You may never have to buy software again. I know that sounds like an ad for another computer "wonder" product. So if your information receptors have been glazed by repeated exposure to the heat of computer industry hyperbole, no one can blame you for being just a mite skeptical. Well, read on, Macduff. This one's for real.

Although most people aren't aware of it, literally tens of thousands of free programs are available today, with some for virtually every brand of computer—programs that run the gamut from sophisticated utilities and productivity software to games and educational programs, with everything in between.

These programs are readily available to anyone. You merely have to know where to look and be prepared to supply or pay for the floppy disk or cassette upon which they are recorded. You can get these programs by mail, by downloading them into your computer over the telephone, or by joining a computer user's group or club in your area. We'll look at each of these options in more detail in a moment. First, here's some background on the free software phenomenon.

What's Available?

By the fall of 1984, there was enough free CP/M software to fill nearly 200 8-inch floppy disks. There was enough free MS-DOS software to fill about 200 single-sided 5¼-inch disks for the IBM PC and compatibles, over 1200 disks for Apple owners, and thousands upon thousands of programs for Commodore, Atari, TI, Timex/Sinclair, TRS-80...free software for virtually any computer you care to name, and the quantity is growing every day. (About the only exceptions are computers that are so new that relatively few units have been sold.)

These programs are free because they are "in the public domain." That's the legal phrase for any work not protected by copyright, and it means that you can duplicate and distribute the programs without seeking the permission of or paying royalties to their authors.

Strictly speaking, because you normally must buy or supply the disk or tape on which a PD (public-domain) program is recorded, or because you pay for the telecommunications charges to obtain software by modem, these programs are not literally "free." Similarly, a related class of PD software, while not "free," is so inexpensive that the cost is genuinely trivial. For example, some software authors grant permission for you to copy a program on the condition that if you like the software and use it regularly, you mail in a modest, voluntary contribution (usually $10 to $45). Programs offered in this honor-system manner are known variously as freeware, shareware, or user-supported software. But because these costs are so minor, I'll lump these free and virtually-free programs together from here on in.

Most PD collections can be divided into these categories: *Utilities* are programs that allow you to perform system-level tasks, such as recovering deleted files, print spooling—to let you use your computer while running your printer—telecommunicating, and so forth. *Game* programs encompass computerized versions of card, board, and dice games like Othello, Yahtzee, chess, checkers, poker, and blackjack; text games like Adventure; paper-and-pencil games like tic-tac-toe and hangman; and arcade-style shoot-'em-ups, Pac-Man, or Frogger-like games.

There are *music* programs that let you compose your own songs or play back any number of classical or popular tunes. There are *graphics* programs that let you draw, save, and print designs with your joystick, mouse, or cursor keys or that let you generate bar graphs, pie charts, and other representations of numerical data.

Public-domain *education* programs, like their commercial counterparts, tend to be flash-card, number, and language drills, though sometimes the graphics are impressive. For *personal and home finance*, you'll find programs for almost any type of interest calculation as well as home-budget makers, checkbook balancers, and stock-portfolio analyzers.

Mathematical, *scientific*, and *statistical* programs are also plentiful. If you're interested in *assembly language*, *FORTH*, *FORTRAN*, *LISP*, *Logo*, *C*, *BASIC*, or any

other language available for your computer, you'll find scads of utilities, subroutines, on-disk tutorials, text files of tips and tricks, and other information to aid you.

Can Free Software Be Any Good?

I know what you're thinking: nobody in his right mind would create a really good program and then just give it away or ask for voluntary payments. Sure as God made little green display screens, they'd go for the big bucks. Ergo, free software can't be any good.

That's a logical conclusion, but it's based on a faulty premise. While it is true that many PD programs are eminently forgettable, many others represent the best work of some very skilled individuals. (The reason most of these folks don't sell their programs is that it's usually too much trouble. Producing personal computer software isn't their main line of work. It's either a hobby or an outgrowth of their primary business.) The fact is, some PD software is as good or better than its commercial counterpart.

For example, MODEM7, one of the most famous free CP/M programs, can hold its own with almost any commercial communications software. The same goes for DIMS (Dan's Information Management System), a CP/M database program. And once you've sampled PC-WRITE for the IBM and compatibles, you will never go back to the leading MS-DOS word processor. (For a look at what some representative PD software really is like, see this month's Software Reviews of three public-domain programs, starting on page 137.) Other PD software is sparer than similar commercial products. It may lack some advanced features or not be as easy to use. And as a general rule, most PD programs aren't as "pretty" and don't have elaborate graphics and visuals.

A public-domain program may also have limited power and capacity. For example, BASICALC, a free Apple spreadsheet, offers 10 columns. But Visicalc and other commercial programs offer 63 or more, plus many more predefined mathematical functions. Similarly, PD file managers and database programs may be more limited in the number of records they can handle and in the amount of information each record can contain.

These limitations, where they exist, may or may not matter to you. Who among us doesn't own a commercial program with features and capacity we never use? But there's another factor that can be far more important, particularly to the new computer user. And that is the quality of documentation and lack of formal program support.

Alfred Glossbrenner is the author of *How to Get FREE Software, How to Buy Software,* and *The Complete Handbook of Personal Computer Communications,* all published by St. Martin's Press.

Photograph by Heine-Stillmark/The Image Bank

Informal Support

Public-domain authors, like their commercial counterparts, would rather write code than documentation and often the instructions they do produce are less than complete. As for support, well, there's no retailer, no dealer network, and no software publisher's hotline.

Passing over the fact that you could easily be in the same situation with a commercial program, it's important to point out that the lack of documentation renders some PD software virtually unusable for novice computer users. However, with just a modicum of computer experience, you usually can figure out how to use an undocumented PD program. Many programs, for example, make themselves clear through on-screen prompts.

Also, the better PD programs usually are accompanied by one or more on-disk text files containing documentation. In some cases, the on-disk documentation may be equivalent to 50 to 100 typewritten pages and include both a table of contents and an index. In addition, some PD authors place their name, address, and phone number in the program and urge you to get in touch if you experience any problems.

The bottom line is that the lack of documentation isn't likely to be a major handicap, except for novice computer users.

Where to Get Free Software

There are three major sources of free software: user's groups, on-line databases, and the last group, which I call "special sources." (See "Special Sources of Free Software," below.)

Although many computer user's groups date from the beginning of the micro era, they're the great unknown resource of the personal computer world because there's no easy way for most computer buyers to find out about them.

The computer dealers in your area are the first place to check for the most current information on user's groups. See if the dealer has a cork-and-thumbtack bulletin board containing notices of user's group meetings. If your salesperson can't help, ask the store's manager. Or, better yet, if the store has a repair shop, see if you can talk to the technicians. They are perhaps the best information source—the most likely of all to be plugged into the user's group network in your town.

Most user's groups cost about $15 to join, and they probably meet in a school or other public building one Saturday a month. If you bring your own blank disks to the meeting, you'll be able to get any software in the group's collection. Usually there will be a $1 to $2 service charge per disk. This money goes to pay for repairs on the librarian's disk drives and helps cover the costs of swapping disks with other clubs.

Regardless of where you live, I also strongly suggest joining the Boston Computer Society (BCS). There is no other organization like it. It's the closest thing we have to a national user's group. BCS has nearly 40 subsidiary user's and interest groups ranging from Apple to Atari to Hewlett-Packard to UNIX/C to Victor, each of which publishes a newsletter and most of which have free software collections. It's the perfect way to plug in to the user's group world.

A BCS membership costs $24 a year and includes a free account on Western Union's Easylink electronic mail service, a subscription to the slick monthly magazine *Com-*

CONTINUED ON PAGE 180

Special Sources of Free Software

Computer user's groups are the best sources of free software. But if no group meets in your area, fortunately there's an easy answer: you can contact a nonuser group source. None of the four firms listed below charges for the software it offers. But because each performs a service, you can expect to pay a little more than the charge assessed by a user's group. Their catalogs will tell you what's available and what it costs.

☐ **AMERICAN SOFTWARE PUBLISHING CO.**

POB 57221, Washington, DC 20037, (202) 887-5834 (9 a.m. to 3 p.m.)

For: Apple, Apple Pascal, Apple CP/M, Atari 400/800/1200, Commodore VIC-20, Commodore 64, IBM PC and PCjr, TI 99/4, Timex/Sinclair, TRS-80. "Best of" category collections (Games, Utilities, Business, etc.) typically include 10 to 15 cassettes or tapes and cost between $30 and $75. Tapes are $5 each; disks are $7.50. For an annual fee of $75 you can also join the National Software Lending Library and borrow and copy every program the company offers. A free catalog is available.

☐ **PC SOFTWARE INTEREST GROUP (PC/SIG)**

Suite #130, 1556 Halford Ave., Santa Clara, CA 95051, (408) 730-9291

For IBM PC and compatibles. PC/SIG is rapidly becoming the library of record for free and user-supported IBM PC software. At this writing, there are nearly 200 disks, including PC-WRITE, PC-FILE, and PC-CALC, and the collection is growing every month. Disks are $6 each, plus $4 per order for postage and handling ($10 for foreign shipment). A 110-page catalog is available for $5.95 (ppd.). PC-TALK can be obtained only by sending the requested contribution ($35) to the Headlands Press Inc., POB 862, Tiburon, CA 94920.

☐ **PUBLIC DOMAIN INC.**

5025 South Rangeline Rd., West Milton, OH 45383, (513) 698-5638 (10 a.m. to 5 p.m. EST)

For Commodore 64, VIC-20, Commodore PET, and Plus/4. Cassettes and disks are $10 each; disk formats supported are: 2040, 4040, 2031, 1540, and 1541. Each disk or tape contains 50 to 70 programs of all types; free catalog.

☐ **ELLIAM ASSOCIATES**

24000 Bessemer St., Woodland Hills, CA 91367, (818) 348-4278 (after 7 p.m. Friday to Sunday)

For CP/M users. Unlike other CP/M sources, which supply software in only the standard 8-inch CP/M disk format, Elliam can give it to you in over 40 formats, everything from DEC to Otrona to Zorba. The only major exceptions are Apple and Commodore CP/M. All costs depend on your disk capacity but typically range from $10 to $15. A comprehensive 60-page catalog of CP/M disks costs $7.50. □

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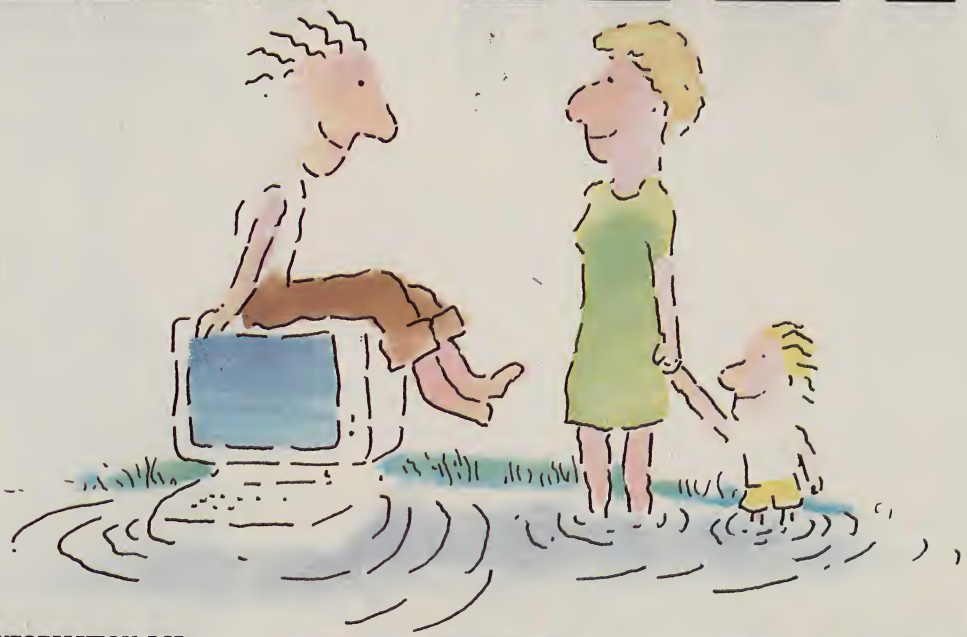

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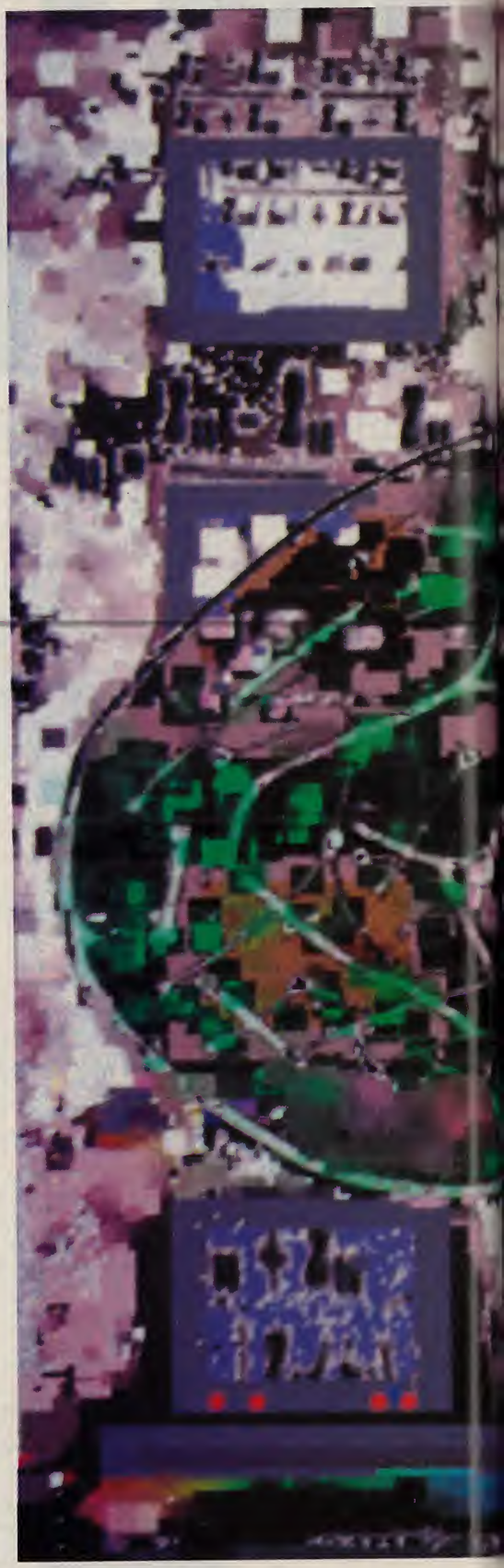
Gödel's Doom



A WORK OF FICTION
BY GEORGE ZEBROWSKI

"SO what are you going to beg time for now?" I asked as Witter slid in across from me in the cafeteria booth. A thin, hyper type, he folded his hands in front of my coffee and said, "It's an experiment I want to run on the new AI-5." He spoke very precisely, very insistently, as usual. "I've been haunted by it all my life, but now it can actually be done."

"What do you mean?" I asked, picking up my coffee, afraid that he would knock it over.

"Well, previous Artificial Intelligences were too slow and not capable of complex inference. The question is how much time can you give me?" He brushed back his messy brown hair.

"How much do you need?" I sipped the coffee, sensing his restrained excitement. Witter had always been a valuable worker, so I had to listen and try to keep him happy, within reason, despite his nervous enthusiasms. But he was never satisfied with merely testing equipment and programs for industrial applications.

George Zebrowski is the author of over 50 short stories and essays. His most recent novels are *Macrolife* (Harper & Row, 1979), *The Omega Point Trilogy* (Ace, 1983), and *Sunspacer* (Harper & Row, 1984). The *Monadic Universe* (Ace), a collection of science-fiction stories, will appear this spring.

Illustration by Elizabeth Rosenzweig/Visible Language Workshop—M.I.T.

"I don't know," he said cautiously. "A lot maybe. More than a couple of days."

I put down my coffee, irritated. "You don't know? Can't you estimate?"

"Nope. I'd better explain."

"Go ahead."

"You know about Gödel?"

"I know Gödel's proof, but tell me from scratch. You might be doing some illegal reasoning."

He leaned forward as if he were going to tell me a dirty story. "Well," he said, lowering his voice, "you're familiar with the conclusion that no machine-like entity that proceeds by clearly defined mechanical steps can complete any system that is rich enough to generate simple arithmetic—that is, make it a consistent system in which we could not come up with new, true, and still unproven propositions, in fact ones that would be unprovable in the system, yet clearly true."

"I know, math can't be mechanized."

"Not completely mechanized. We've done it to a remarkable degree. . ."

"What else is new?"

"Well, if Gödel's proof is true, and human minds can regularly generate true but unprovable propositions in any potentially self-consistent system, then mechanism, or determinism, does not apply to us."

"But what is it that you want to *do*, Witter?" I was only half listening. It was late in the day. The cafeteria was nearly empty and the newly polished floor was a large mirror; our booth seemed to float on it.

"Well," he said, "I want to give the new Artificial Intelligence the command to complete mathematics."

"What?" I suddenly saw what he was getting at.

"Don't you see? We can do an experiment that might settle the nature of the universe—whether we live in a hard determinism or a soft one in which free will is possible."

I smiled, feeling superior. "But we know Gödel was right. Math can't be completed. He gave a powerful formal proof, one in which you can't have it both ways."

Witter, who had been looking away as we spoke, turned his head half around and fixed me with one glassy brown eye. "Come on, Bruno. Why not run the experiment anyway?"

I shrugged and sat back, looking around. "As you said, it might take a long time—forever, if Gödel's right."

"Maybe," he said, finally looking at me with both eyes. The combination of the blue and brown eyes had always given me the creeps. "According to Gödel, the computer will crank out mathematical statements forever, and we'll never know if the body of the system is a complete one. But if it is complete, then our AI will finish it off in some finite period of time. It's the fastest system ever developed, able to do involved operations that might take centuries otherwise."

"No matter how fast it is, we won't disprove Gödel. He proved that independently of all need to do experiments! Now I know why you want a lot of time. We won't live long enough to learn the result, even if you're right, which you can't be." I started to get up.

"Look," he insisted, "why not do the experiment? If we live in a hard determinism, as so many believe, then it's already true—the AI will complete math or any system we give it. But if Gödel is right, the AI-5 will run on forever, unable to complete."

"We don't have forever. You've gone bonkers."

"Why don't we do it? We *can* do the experiment! Look, for the first time an experiment involving pure logic and math may yield knowledge of the world outside."

That part appealed to me, but I saw a way of being perverse. Was he presenting me with a choice or dictating that I authorize the experiment?

He smiled, anticipating my thought. "Either there's free will, or you're fated to let the experiment be done."

I sighed. "But there's still the matter of how long it will take, Felix. AI-5, no matter how fast it is, may keep running and we won't be able to tell whether it's an uncompletable process or just a very long one."

He shrugged. "Aren't you willing to take the chance?"

"This just doesn't make any sense to me at all."

He smiled again. "But it gets to you, doesn't it? My point holds. Why not do it? Just to see. How often in the history of math or logic has there been a chance to do pure theoretical work that might reveal something about the real world?"

"But it's doomed to fail!"

He nodded. "Probably, Bruno, I'll grant you that. But even so, the experiment will be historic. Purely mathematical and empirical at the same time."

"Romantic mathematics, I call it."

"Or Kant's synthetic a priori!"

I'd read some of that metaphysical junk, and he seemed to be stretching it. Sure, synthetic meant acquiring new knowledge, and a priori meant that it wasn't derived from experience, strictly speaking, but from reasoning. Our experiment would give us new knowledge of the universe through nonempirical means. "But you're cheating," I said. "Whatever you call it, using the AI

"Well," he said, "I want to give the new Artificial Intelligence the command to complete mathematics. Don't you see? We can do an experiment that might settle the nature of the universe. . ."

means only doing an empirical experiment."

He cocked one eyebrow and gave me a crazed stare with his blue eye. "Would you say that it would be more empirical if we did it by pencil and paper? That's all Gödel had to work with."

"Okay, I guess I'll have to say that there are no purely a priori activities. Even using the mind alone is a way of reaching out into the universe. What we call experiments are merely corroborations. Einstein himself said that if the experiments didn't come out as he expected, then he'd pity the God who made the universe that way."

"Okay, Bruno, I know you know more than most section chiefs, but are we going to do it or not?"

So we ran the experiment, if you could call it that. Witter was right about one thing. If Gödel's proof was somehow wrong, and we could complete even one system on our fast AI, then a lot of people would have to do a lot of rethinking in the groundwork of logic and math.

But I knew damn well that Gödel couldn't be wrong. Formal proofs do not fall easily. It would be a mistake of some kind if our AI-5 showed that completeness in a significant system was achievable.

All right. We both wanted to see what would happen if we tried it. We pieced the time together from a dozen other projects when people would be away or on vacation.

It was Friday night, after hours. We would be alone until Monday. I sat down at the keyboard and tapped in the command. Witter was sitting next to me, staring up at the bank of screens.

The AI began its run, building arithmetic up out of baby talk. Soon it was all going by in a blur, but the AI showed no sign of slowing down.

"There is one danger," I said as we sat back and waited. "If the AI can't complete arithmetic, it will sift through larger and larger banks of information. . ."

"It can handle infinite amounts of data," Witter replied.

"Yes, but the power needed for that, Witter, the power! The cost!"

He shook his head. "Don't shout. That won't happen. It will all be over in a few hours at most."

But the AI-5 kept running. An hour went by.

"It's not going to stop, Felix. It can't. Gödel was right. But even if he was wrong, it may take more than our lifetimes to prove it."

"Take it easy, Bruno. Go polish the floor, or something." He was too serene.

Another hour went by. Witter stared at the screens, hypnotized by the blurred flow. Rivers of reasoning ran from their headwaters to a new ocean of well-formed propositions, and still the ocean was not filled; it would never be filled.

As I looked around at the clean right angles of the room, at the symmetrical terminals and easily accessed units, I began to think that maybe Witter was slightly stupid, that he didn't understand simple logic or the idea of a proof. Gödel's paradoxical conclusion could not be broken, unless it wasn't a double bind to begin with, because you can't have it both ways. Something was very wrong with Felix Witter.

And yet, I wanted him to have a point. This was an experiment, a recourse to more than personal opinion; it could do more, in principle, than reasoning, prediction, or guesswork. Set a powerful genie to do the impossible—not because you think the genie can do it, but because you can ask, and it has the power to do all that's possible. So why not ask, just to see; human beings have always been suspicious of mere reasoning, no matter how powerful. Suddenly I wanted to see Gödel fall, to see the pride and arrogance of mathematicians crumble.

But as we watched the AI-5 chase the mirage, there was no sign of an end, no slowdown at all.

"I'm hungry," I said. "Want a pizza?"

He nodded without looking at me. I got up, went out into the hall, and called it in from the wall phone. Then I alerted the security guard downstairs and asked him to leave it out on a cart in front of our workroom.

"We may have to stop it," I said hours later, "even if it's close to completion." Though the pizza had been very bad, I thought as I eyed the empty boxes on the cart, a full stomach had taken some of the romance out of what we were doing. "We can't tie up all this power and time indefinitely. It's using more every minute, and it'll be my ass if we can't justify it."

"No!" Witter shouted maniacally. "It may be very close."

I burped, waiting for my heartburn to subside. The AI-5 hummed along.

"We can continue from this point onward at another time," I insisted.

"Be quiet!"

I reached over to stop the run. Felix grabbed my hand and pinned it to the panel.

"What's wrong with you?" I demanded.

"Just a few minutes more," he said, fixing me with his mismatched eyes. "We're at the edge of a major discovery!"

"Felix, this can't be done." I struggled to free myself, but his strength was that of a true believer.

"Be still, you fool," he said harshly. "Don't you see? This will be the culmination of our careers. We'll never

match this no matter how hard we work. Gödel is one of the supreme monuments of mathematics, marking the limits of human minds. If we topple him. . ."

"You may not like what you get," I said, twisting my arm. "If his proof is right, then mechanism is false and minds are not machines. They escape the completeness of the purely mechanical. But if Gödel is wrong, then we're automatons! I'd rather not know."

He shook his head. "There's even more to it than that, Bruno."

"What?" I was breathing very hard, unable to free myself.

"We're opening up the very vitals of reality."

I had to laugh. "By manipulating man-made symbolic structures? You need a bucket of cold water to soak your head in. Let me go!"

"Completion may be only a few minutes away. Do you want to stop and then wonder what might have been?" He tightened his grip.

"But you can't know how far along it is."

He let go of my hand and seemed to cool down, and I found I didn't have the heart to reach over and stop the run.

"You're right," he said, 'I'm sorry. It probably is all for nothing."

I massaged my hand. The AI continued its work run. "Don't feel too bad about it," I managed to say. "It was a nice idea, but it had to confirm Gödel. I'm glad we're not machines."

He was shaking his head. "You don't understand. There's no reason to fear that. It's not a problem."

"What isn't?"

"Free will," he said as the AI-5 stopped its run.

Witter and I looked at each other, then at the main screen. It read:

SYSTEM CAPABLE OF GENERATING ARITHMETIC COMPLETE

"It's a mistake of some kind," I said. Something strange seemed to pass across my eyes. I sat back, expecting to lose consciousness as the tension got to me.

"Maybe," Witter was saying, "but we can test to see if it's a mistake."

"How?" I heard myself ask, even though I knew the answer.

"By trying to make a true statement that is not provable in the system. As long as the AI can show us that we can't make such a statement by proving it, then the system is complete."

The room went black for a second. "But maybe we can't make such a statement," I said.

"We can try," he answered.

We tried for the next 12 hours. I was relieved that our prime AI was no longer running a huge power draw. Witter brought a smaller AI on-line and had it question the alleged complete system achieved by the AI-5. It failed to come up with a single true proposition that was not provable in the complete system.

"There's no question about it," Felix said finally.

"There's only one thing left to do," I replied. "We've got to run the whole thing again."

Witter looked at me, smiled strangely, then sat down and gave the command.

As the AI-5 began its second run at Gödel, Witter turned to me and said, "Funny about determinism. I always think of it as stuff outside me, pushing at my skin. But I feel free inside. When that second run finishes, we'll be certain that we're living in a hard determinism. No choice is our own, if we've understood the word correctly. Even our decision to run the AI-5 again was not made freely. We're automatons. No avoiding the conclusion, Bruno."

He was baiting me, I was sure. "But we resist the notion. Doesn't that suggest something?"

He shrugged. "That we're free in our minds but not in our actions. We can envision alternatives, but whichever one we pick is determined, right up through an infinite future."

"Witter, I thought you were intelligent. There can't be such a thing as unconditioned freedom. There are always initial conditions—necessary and sufficient conditions for every choice. Otherwise we could perform miracles, make happen things that are uncaused. The existence of free will cannot violate causality."

He grimaced at me and I felt stupid. "Yeah, I know all that. But *do* we have the freedom to choose between alternatives?"

"I think we do. Physical conditions make us both the determined and determinators in our own right. Things affect us and we affect them. Determinism goes right down into us, into our consciousness and will, and we send it back out. I couldn't prove it to you without a physiologist, though."

The AI-5 was still running its second completion smoothly. If it succeeded, then it might be that we were living in a universe where even choice among alternatives was an illusion.

"It's a mistake of some kind," I said. Something strange seemed to pass across my eyes. I sat back, expecting to lose consciousness as the tension got to me. "Maybe," Witter was saying.

Witter looked at me suddenly. "I wonder if our running this program can have an effect on the universe we live in?"

"What are you talking about?" I asked. He seemed to have a mind like a break dancer.

"Maybe our attempting what Gödel said was impossible can change the universe?"

"I don't think so, Felix. But there are other things you might like to consider."

He took a deep breath. "What's that?"

"Well, we began with the idea that no finitary deductive system can complete a rich, self-consistent system. But what if the AI-5 is not a finitary deductive system? Assume it can work outside the limits of the human mind, which is all that Gödel may have charted. It was all he could demonstrate because he had only his own mind to work with."

Witter nodded. "I see what you mean. If our AI reaches completion, then it follows, perhaps, that it's not a finitary deductive system, and we can draw no conclusions about the nature of the universe."

I smiled. "Right. And we don't have to worry about being automatons, or that our sense of inner freedom is a mirror trick of some kind. Free will is a special case of determinism. It's determinism from the inside. The means of determinism are also those of free will."

Witter was watching the screen with a worried look on his face, as if he now expected the AI to fail. It didn't matter one way or the other, if what I had said was true.

"Unconditioned free will would be omnipotence," I continued, "and that's an absurd state to be in. No law, no causal structures. It's just a conceptual extreme, like infinities."

"Something is working against us," Witter said softly.

"What do you mean?"

He gripped the panel. "It won't come out the same way twice," he replied.

"You're still mistaking the maps for reality," I said.

"Look at the time, you fool! It's almost as long as before. If the AI doesn't repeat its completion in the same time, it will run on forever."

"So what. We have the first completion in memory, step by step, for whatever it's worth."

He swiveled his chair and glared at me. His eyes were bloodshot and had dark circles around them. The whole experiment, I saw, was eating up his entire energy. "You don't see, do you?" he said. "You think in terms of tricks of language, ways of speaking...you can't imagine worlds dying and others supplanting them. You don't give a damn about anything except apportioning time and keeping other administrators happy."

"What are you talking about, Felix? I'm here with you, and we're doing what you wanted. Have you lost your mind?" I almost felt hurt, as if he were questioning my loyalty.

He pointed to the clock on the wall. "Look, time's up and our AI is still running."

"So what? It was a fluke the first time, a mistake. You can't beat Gödel, and it wouldn't matter if you could."

He laughed. "You still don't see!"

"No, I don't."

The AI-5 was still running.

"It will run forever this time. Our decision to run the experiment puts us at a great juncture between possible universes. We collapsed the wave function reaching our minds."

"What are you saying?" I demanded.

"Proving that *our* universe was deterministic threw us into a freer one. Gödel proved his work in the wrong universe. Here the AI will run forever. But if we stop it and start again, something even stranger might happen."

"You're off the deep end now," I said, feeling sorry for him.

"We might be moving across a whole series of universes, drawing closer to the unconditional omnipotence that has the true freedom to be everything..."

"Yeah, and can't become anything in particular. That's what I was saying. Witter, wake up. We have the other program. Go see for yourself. That system was completed. In this one there's obviously some kind of difficulty. Neither result means a thing. Get that through your stupid head!" Mathematicians were all idealists to some degree or another, always secretly believing in the literal existence of infinities, numbers, and tortured geometries. Witter was no exception.

He shook his head and smiled. "There's nothing in the memory, Bruno. See for yourself. Go ahead, punch it up."

I leaned forward and punched in the order. Nothing came up. I went into search mode. Still nothing.

"We've left that universe behind," Witter said.

"It's got to be here," I said.

The screen remained blank.

"You erased the memory!" I shouted.

"I did not," he replied softly, and I knew he was telling the truth.

I glanced at the food cart; it winked out of existence.

"Did you see that?" I asked.

"Bruno!" Witter shouted. "We've escaped a totalitarian cosmos. We're free!"

"Relatively," I said, shaken.

He was looking at me strangely, and I saw that both his eyes were now brown. As the AI-5 continued its endless run into a free infinity, I feared what we would find when we went outside... □

CONTINUED ON PAGE 168

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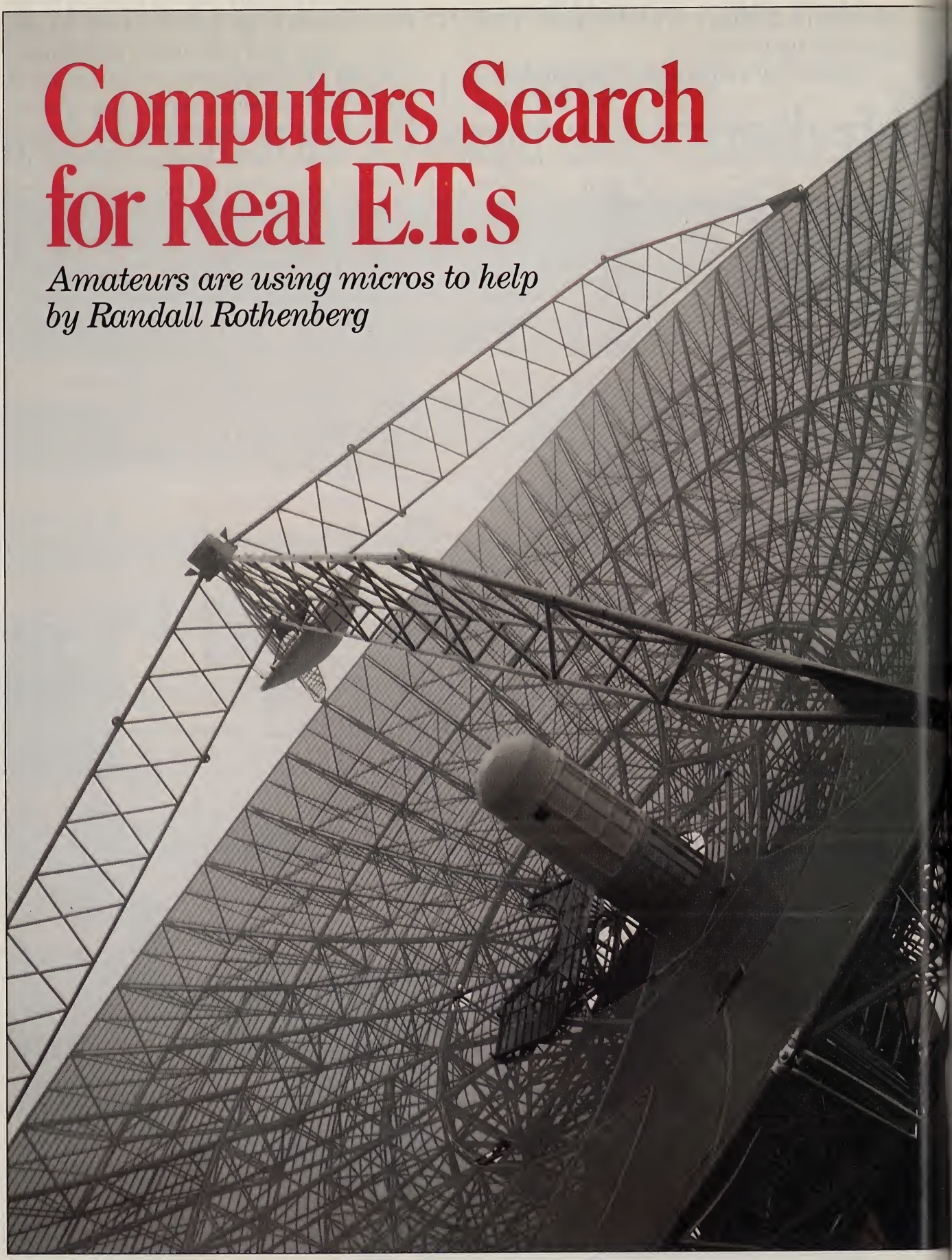
Computers Search for Real E.T.s

Amateurs are using micros to help

by Randall Rothenberg



One of the most chilling lines in cinematic history came at the conclusion of *The Thing (From Another World)*, the 1950s science-fiction classic that starred James Arness as a mute, bloodthirsty, 7-foot extraterrestrial vegetable bent on wreaking havoc in an isolated Arctic military station. You may recall the basics of the plot: after discovering a flying saucer buried in the frozen tundra and accidentally defrosting its occupant, the men find their attempts at communication met with destructive behavior. So they rig up an electric-arc generator and transform their unwanted guest into ratatouille. Having vanquished the Thing, they crowd around the base radio to inform Washington of their adventure.

"What should we tell them?" asks the radio operator. Replies a colleague, "Tell them—to watch the skies."

Decades later, Americans are heeding that admonition. They are closely watching—or more accurately, listening to—the skies while engaging in a curious sport known as SETI: the search for extraterrestrial intelligence. These are boom times for SETI. Although speculating about the existence of life on other planets is an ancient and noble occupation, today it can claim support from the National Aeronautics and Space Administration, major universities, and a small but growing group of dedicated amateurs.

Why the sudden popularity? Some SETI enthusiasts tip their hats to the movies; *E.T.* and *Close Encounters of the Third Kind* have certainly helped their cause. But would-be alien-watchers are unanimous in pointing to an innovation that is less cultural than technological: the personal computer.

"Micros have made all the difference in the world," asserts Paul Horowitz, a youthful Harvard physicist whose SETI project, funded by the Planetary Society, has been called "the Cadillac of SETI" by a NASA staffer. "We can do in one minute what would have taken the earliest SETIs 100,000 years," Horowitz explains. Thirty miles from Horowitz's Cambridge laboratory, in a tree-enshrouded glade, an 84-foot radio telescope slowly and methodically scans the skies. Every 30 seconds, inside a control building adjacent to the large parabolic dish, a graph with a long baseline and a single large spike appears on the screen of a WICAT System 150 microcomputer, depicting the radio noise being received from the stars and galaxies beyond the earth. Any time the peak grows beyond a certain intensity, the machine beeps and records the information on a Winchester hard disk for later analysis. Was the spike merely radio interference? Probably. A pulsar? Maybe. A transgalac-

TWO *years ago, Project Sentinel joined the search. Its 84-foot radio telescope (left) sweeps the skies for signals, feeding them for analysis to a microcomputer setup designed by project director Paul Horowitz (above).*

Randall Rothenberg is the author of *The Neoliberals: Creating the New American Politics* (Simon and Schuster, 1984) and a contributing editor of *Esquire* magazine.

otographs by Mike Blake

tic civilization? Probably not. But with the computer's method of digital analysis, Horowitz needn't guess. "Straight silicon," says Horowitz, referring to the computer's method of digital analysis. "In SETI, that's now the way to go."

SETI, indeed the science of radio astronomy itself, is undergoing a transformation not unlike the one computer science experienced earlier. What was once the province of a rarefied cadre of Ph.D.s working for the wealthiest institutions has reached the level of homebrew. Searches once conducted by professional astronomers who borrowed time on the government's massive radio antennas and room-sized supercomputers are now carried out by amateurs (albeit knowledgeable ones) with backyard dish antennas and inexpensive microcomputers.

Tuning in the Right Channels

No matter how it's conducted, SETI rests on a few laws of physics: heat an object—any object—and it gives off radiation. Objects heated to different temperatures emit waves of different frequencies, including radio frequencies. The universe is a tremendous transmitter of radio waves—galaxies give off waves of certain frequencies, as do dwarf stars, supernovas, and quasars, all of which create audible and visible broadcast interference. For example, if you were to point your TV antenna straight up and attach your television set to a chart recorder, you would see additional interference when the Milky Way passed overhead. The basic technique of radio astronomy is the capture and computer analysis of these waves from on high, which give us a picture of the universe vastly more detailed than anything we receive from visual astronomy.

Astronomers searching the skies for radio waves from intelligent civilizations tune their receivers in to extremely narrow frequency bands (or channels), assuming that a civilization would target its signal finely to differentiate it from natural celestial radio signals, which are very wide. Furthermore, SETI researchers focus their efforts on a region in the radio spectrum where they think other civilizations are most likely to transmit a signal—the region where emission from hydrogen, the most abundant element in the universe, predominates. Moreover, with the least interference from other

EACH *day, Project Sentinel's telescope sweeps a different area of the sky. Currently, its signals are broken down into 131,000 narrow channels for simultaneous analysis. Horowitz is now working on an analyzer that will scan 8.4 million channels at once.*

natural sources, this region offers astronomers a perfect area for undisturbed searching. It stretches from 1420 megahertz (1420 million cycles per second)—the frequency at which hydrogen atoms emit radio waves—to about 1700 MHz, near the broadcast frequency of the hydroxyl ion. Because a water molecule results from joining a hydrogen ion with a hydroxyl ion, astronomers refer to this region of the spectrum as the radio "water hole," the place where our civilization is most likely to meet theirs.

NASA currently has a yearly SETI budget of $1.5 million and the equivalent of 10 full-time staff members at the Jet Propulsion Laboratory in Pasadena, California, and the Ames Research Center in Moffett Field, California. Supplementing NASA's effort is the work of the Planetary Society, a nonprofit organization founded in 1980 by Cornell astronomer Carl Sagan and Bruce Murray, former head of the Jet Propulsion Laboratory. The society's Project Sentinel scans 131,000 channels simultaneously in its search for an extraterrestrial signal, feeding the information for signal analysis to a WICAT microcomputer, a 68000-based computer from the World Institute of Computer-Aided Teaching in Utah.

But searching the frequencies of the water hole in all directions of the sky, narrow channel by narrow channel, is an overwhelming task. The Milky Way galaxy is home to some 300 billion stars, and approximately 10 billion other galaxies exist in the known universe. Some astronomers believe there may be 10 billion life sites in the Milky Way alone from which a signal could originate. Even a search of a mere one million stars would take 20 years glued to a dish.

"There are assumptions everyone has to make about the nature of the signal we expect," says Dr. Kent Cullers, a SETI project scientist at NASA Ames responsible for developing computer algorithms to analyze the signals. These assumptions, according to Cullers, are aimed at narrowing the scope of NASA's project to make it more manageable. "But that means there are still many frequencies we are not looking at and many different signal types we can't spend time on. That's where amateurs come in."

Today, amateurs are conducting searches for extraterrestrial intelligence by adapting existing microcomputer equipment and using software that allows 8-bit microcomputers to perform signal analysis. An amateur can put together a home-brew system for less than $5000, including the computer (see "Alien Watching in Your Own Backyard," page 98).

Computers have several uses in SETI, but the most important is performing a fast Fourier transform (FFT). The FFT is the mathematical tool that forms the basis of many important computing functions, notably the CAT scan so critical in medicine today. FFTs are available on plug-in boards for many popular micros and can also be found on disk. A Fourier transform enables a computer to separate the noise coming into a receiver into its distinct components and then tell the strength of each signal.

"Doing this analysis fast is where the trick is," says Cullers, who helped develop a machine-language FFT for computers with 6502 microprocessors. The SETI ideal is to accomplish the signal analysis in real time; that is, to pinpoint the frequency and strength of signals as they are received, rather than capturing the signal on tape or disk and analyzing it later. "If you're willing to narrow your bandwidth at the outset, you can limit the input to your computer so that it can do real-time analysis," says Cullers. In other words, amateur searchers face a trade-off: they can finely target their searches, looking only at specific frequencies in the water hole and do the FFT in near real time; or they can capture a broad signal and slowly look at the component channels one by one.

"The Fourier transform looks for sine or cosine waves that repeat over and over again. If you have a nonrandom occurrence of a signal, it'll tell you," says Karl Lind, an engineering associate at SRI International in Palo Alto, California, and an amateur SETI enthusiast. Lind uses a Timex Sinclair computer and three 12½-foot dish antennas to search for signals from Sigma Draconis, a "local" star some 18 light-years from earth. "Finding a pure sine-wave signal is virtually unknown," says Lind. "If you find one, it's a real find." Because of the importance of the FFT, some SETI searchers use a dedicated spectrum analyzer instead of a computer with an FFT board or software to separate the incoming signals into distinct narrow broadcast bands.

A Beacon from the Sky

Ah, but what would an amateur be listening for? Kent Cullers likens the problem faced by E.T. watchers to sifting through an entire set of the *Encyclopaedia Britannica* each second. "Assume that the set of encyclopedias is filled with random numbers," says Cullers. "You've got to go through it and look for a single coherent sentence. And you've got to analyze it in real time." What's more, Cullers adds, "the only thing we're interested in looking for are things that happen over and over again, not one-time events."

Given the difficulty of the task, all SETI enthusiasts operate under a set of assumptions. For instance, most assume that a civilization would be likeliest to develop adjacent to a sun-like star; there are 773 such orbs within 80 light-years of earth. They assume that a civilization would intentionally broadcast a signal into space in hopes that another intelligent race would pick it up. Some go a step further: they assume that the extraterrestrials would be advanced enough to detect the increased radiation emanating from the vicinity of our sun during the past five or six decades that man has been broadcasting television and radio waves, transmitting microwaves, and exploding nuclear devices. Thus, the reasoning goes, extraterrestrials would aim their signal in the direction of our solar system. Amateur and professional searchers refer to the presumed signal as the "beacon."

SETI folk differ in their opinion of what the beacon would look like or what it would lead to. Nikola Tesla, the eccentric early-20th-century inventor, maintained that it would be a series of pulses reading, "One... two...three..." and so on. Many believe that the signal will be string of prime numbers. The Planetary Society's Paul Horowitz feels that any extraterrestrial broadcasters would adopt "a two-pronged strategy: a beacon and a message." That view has some support in amateur circles.

"One of the odd things to me is that many astronomers are asking only, 'What's the minimum we might get?'" says Robert Gray, a Chicago-based searcher. "They don't speculate on what we might really get." Gray, the founder of Gray Data, which publishes microcomputer reference cards, has invested thousands of dollars in his

Alien Watching in Your Own Backyard

"E.T. watching," a small niche in the field of radio astronomy, is an excellent place for an amateur to begin an aural exploration of the skies. A simple component system can be set up for well under $1000, exclusive of the computer, but there is a caveat. "If someone tried to put together a system from a block diagram," explains Robert Gray of Gray Data, "it wouldn't work. There are design specifications that are necessary. One has to go to the textbooks or the experts." Fortunately, both exist and are readily accessible.

The first thing an interested searcher should do is contact the Society of Amateur Radio Astronomers and its president, Jeffrey M. Lichtman, at 40 Winside Lane, Coram, NY 11727. SARA operates its own amateur SETI program on Long Island, and its newsletter has published recipes for home-brew SETI systems as well as computer programs—written in BASIC—to perform frequency analyses of sky noise. Lichtman has written three books, *Solar Amateur Radio Astronomy* ($7.50), the *Amateur Radio Astronomer's Circuit Cookbook* ($7.50), and *Microwave Radio Astronomy, An Amateur Introduction* ($18.50), that are among the best reference works for the true beginner. They are available at the above address.

Robert M. Sickels, SARA's secretary, has published the definitive work on amateur radio astronomy. *The Radio Astronomy Handbook*, available from Sickels at 7605 Deland Ave., Ft. Pierce, FL 33451 ($32, with a 20 percent discount for SARA members) contains detailed instructions on setting up a backyard radio-astronomy observatory and modifying off-the-shelf satellite television equipment to serve the purposes of SETI. The book also includes a description of a complete SETI system based on the Timex Sinclair. Sickels has offered the entire system for sale, but the disconti-

SETI operation. He watches the skies with a dedicated 256-channel spectrum analyzer built by Hewlett-Packard, a 12-foot steerable parabolic dish antenna, and a Compupro 8/16 microcomputer with the CP/M operating system. He has spent the past decade speculating about the nature of the message we someday might receive.

"Since we can't have a real-time conversation," says Gray, "it seems to me that we'd get the whole story. If it were my job to send messages to other stars, I'd send a minimum of the *Encyclopaedia Britannica*. If I had the funding, I'd send the entire Library of Congress! If dialog is out of the question, the next best thing is to tell your story.

"I don't think I'll ever pick up little green men," adds Gray, with only a slight touch of whimsy. "But when somebody does find something, the exciting thing will be interpreting it."

Translating the Signal

Unsurprisingly, many searchers believe they have already picked up something. "There's no question that SETI is a focus for 'strange events,'" says Kent Cullers of NASA's search project. "If someone has a strange experience, chances are it will cross my desk. Last week, a fellow called me to get computer equipment to contact the UFO that's been chasing him." Nevertheless, Cullers says that serious amateurs have not plagued

nuance of the Timex Sinclair has made some of the components scarce. Write him for information about current availability.

A SETI component system breaks down into two segments, one for receiving signals and the other for analyzing them. While computer owners may be generally familiar with the back end, the front end—which consists of a dish antenna, a low-noise amplifier, a mixer, a receiver, and a baseband amplifier—may seem like foreign territory. Yet locating the equipment should involve little effort. "Anyone who can put together a satellite television setup can put together a decent amateur radio astronomy observatory," says Dr. Kent Cullers of NASA's SETI program. With only a few modifications, a satellite TV reception system can be used as the front end of a SETI operation. Again, though, caution must be taken that the equipment purchased is capable of being modified for the specific bandwidth to be searched.

Front-end equipment can be found at electronics surplus and discount stores and through military surplus catalogs, but the best place may be one of the satellite television supply houses now proliferating throughout the country. Two of the best are B.R. Satellite (35 Lumber Rd., Roslyn, NY 11576; 800-421-0148) and Echosphere (1925 West Dartmouth Ave., Englewood, CO 80110; 800-521-9282). Because of an influx of new, high-quality antennas from Japan, a small (5 to 6 feet) dish may cost as little as $100 new. Large dishes (20 feet and over) can cost tens of thousands of dollars in a pristine state, but because they become obsolete for professional purposes relatively quickly, they can often be picked up at surplus prices. *The Radio Amateur's Handbook* (The American Radio Relay League, Newington, CT 06111), the bible of ham radio enthusiasts, is also an excellent place to turn; it has instructions for building home-brew antennas for under $100.

In general, low-noise amplifiers, mixers (for converting the incoming signal into a frequency the receiver can understand), receivers, and baseband amplifiers are available from anyone who sells complete satellite TV systems. Again, prices vary. Low-noise amps can be purchased for $100 to $300 new. Depending on the frequency range of the signals being explored, the receiver can be either a TVRO (television receive-only) receiver or a standard short-wave receiver. Radio Shack and Heathkit have many varieties of these, starting at under $100.

Any off-the-shelf TVRO or radio astronomy equipment will have to be modified before it is applicable for SETI projects. The easiest way to make sure your equipment is compatible is to find someone who can locate and modify all the equipment for you. Many stores that sell satellite television equipment will modify the antenna and receiver to accommodate certain SETI frequencies. In New York, Ken Schaffer of Orbita Technologies Corp. (21 West 58th St., New York, NY 10019) is the satellite TV whiz-of-whizzes. Serious amateurs would do well to contact him about purchasing and modifying TVRO dish antennas, receivers, and amplifiers.

The back end of the system is even simpler, consisting of nothing more than a computer, an analog-to-digital converter, and the fast Fourier transform that turns your computer into a signal analyzer. A/D converters are available as plug-in boards for virtually any microcomputer system. For instance, Hollywood Hardware (6842 Valjean Ave., Van Nuys, CA 91406) advertises a 12-bit, 16-channel board for the Apple II Plus and IIe for $299.95. Tecmar makes an A/D converter board for the IBM PC for $495.

Software FFTs, common mathematical tools, can often be found in the public domain. One software FFT specifically for amateur SETI enthusiasts is available in assembly language from Kent Cullers free of charge if you write him at M.S. 229-8, Ames Research Center, Moffett Field, CA 94035 (enclose a stamped, self-addressed manila envelope). Cullers's version was written for the Apple but can be modified for other systems.

Once you've purchased the components, modified them, and established a system to watch the skies, then comes the fun...and the tedium. For all that's left is to look and listen—and ponder what to do when E.T. calls.

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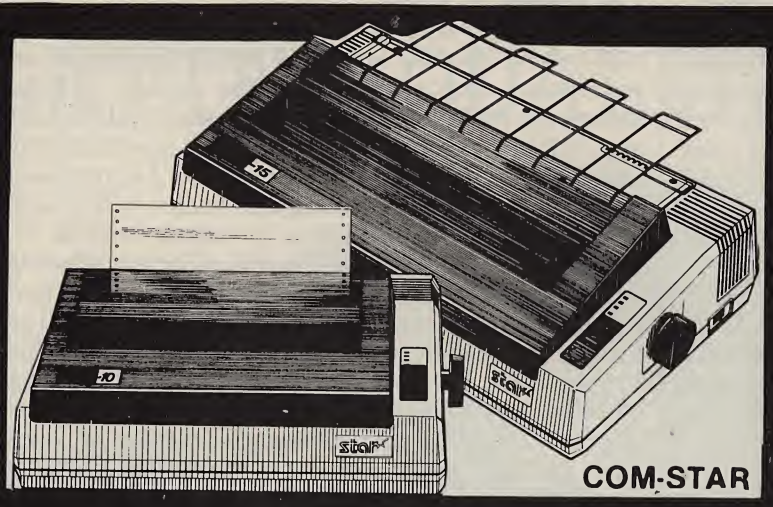

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NASA with reports that turned out to be spurious.

False alarms are, of course, legion in SETI circles. Several years back, for example, astronomers at the National Radio Astronomy Observatory heard a signal at the same time every morning, over a period of several days. Quite convinced that it was real, they did some preliminary investigations. They quickly discovered that each morning at 8 a.m. two local truckers met in a nearby parking lot, started their rigs, and fired up their C.B. radios, creating the "intelligent" signal.

Then again, false alarms sometimes lead to discoveries. The most famous occurred in 1967 at Cambridge University in England. Astronomers received a series of regular blips at intervals of about one second. The source was a well-defined point in the sky. As science writer Edward Edelson noted in his book on SETI, *Who Goes There?*, "In the first euphoric hours after the discovery, the Cambridge astronomers named the source LGM-1. The initials stood for 'little green men.'" Much study was done of the possible beacon, and it was finally determined that it was a previously unknown natural phenomenon, the pulsar.

And there are the unexplained events. In 1977 at Ohio State University—which has the oldest-established professional SETI project in the country and for a time published a journal for E.T. watchers—astronomers saw something they still cannot interpret. "We saw exactly the kind of signal we were looking for," recalls Dr. Robert Dixon, the assistant director of Ohio State's observatory and one of the moving forces behind its SETI program. "It was positively of intelligent origin, positively from outside the earth. But it was a one-time event. It was very strong for a minute and not a fluke. But when we were watching it, it turned off, as if somebody threw a switch." To this day, Dixon and his colleagues do not know what caused the signal; their best guess is that it was a super-secret military satellite. In SETI circles, the Ohio State noise is referred to as "the WOW signal."

Anomalous pulses such as the WOW signal are not rare and provide grist for the amateurs' radio mill. Chicago's Robert Gray, for instance, began his SETI project specifically to search for the source of Ohio State's WOW and now tries to follow up on other reports from serious amateurs across the country. On the North Fork of Long Island, New York, members of the Society of Amateur Radio Astronomers use their big dish and a Commodore VIC-20 microcomputer to chart anomalous pulses. They have recorded unexplained signals repeating every four hours during a 12-hour period emanating from the Crab nebula in the area of the constellation Taurus, as well as from a star in the Big Dipper. Even though such anomalous pulses are, by definition, nonrepeating, astronomers have detected certain patterns to them. At Ohio State, for instance, members of the SETI project have begun mapping the "things that go burp in the night" they have received over the years. "Taken individually, you just shrug your shoulders. But they are not random," asserts Dixon of his findings. "They do concentrate in portions of the sky, particularly in the galactic center."

The Debate on Earth

Because their work has yielded fruitful, if inconclusive, results, and because amateurs and professionals are working so closely to advance the science of radio astronomy, SETI is no longer the bastard child it once was. "SETI is taken very seriously right now," confirms OSU's Dixon. Indeed, the International Astronomical Union, one of the most prestigious bodies in the field, has established a commission on extraterrestrial intelligence. And in 1982, the Planetary Society released a petition endorsing "a coordinated search program" utilizing "current radioastronomical technology." The signers included seven Nobel laureates, among them Francis Crick, the co-discoverer of DNA, and two-time Nobelist Linus Pauling. Others are British scientist Stephen Hawking, the pioneer investigator of black holes, and best-selling author and scientist Stephen Jay Gould of Harvard. Among computer scientists, Marvin Minsky, the former director of MIT's Artificial Intelligence Laboratory, affixed his name to the petition.

SETI is not without opposition, of course. Recently, Carl Sagan engaged in a published debate with physicist Frank Tipler of Tulane University, a vocal and harsh critic of extraterrestrial searches, who told Canada's *McLean's* magazine, "If there were advanced civilizations out there, they would have colonized the entire galaxy by now. They would be here." Added mathematician Alfred Adler of the State University of New York, "Science is being denigrated by such foolishness." To these and other skeptics, the Planetary Society's SETI coordinator, Dr. Thomas McDonough, likes to quote Arthur C. Clarke's First Law: "When a distinguished but elderly scientist states that something is possible, he is almost certainly right. When he states that something is impossible, he is very probably wrong."

Regardless of the opposition, dedicated SETI enthusiasts are unlikely to be deterred, even if their efforts at locating intelligent life beyond the earth prove futile. In fact, many predict that E.T. watching will grow in popularity, thanks to the increased availability of appropriate microcomputer analytical tools. "It'll be like comet watching," asserts Karl Lind of California. The growth may be all for the best, since some professionals believe there may be only a 20-year window, rapidly closing, until terrestrial radio noises become so loud that they will effectively blot out any incoming intelligent cosmic signal.

But even if E.T. doesn't phone Karl Lind or Robert Gray or Robert Dixon or the Society of Amateur Radio Astronomers or Paul Horowitz or even NASA, all the effort will not have been in vain. As Kent Cullers of the space agency says, "Even if I don't detect a real SETI signal in my lifetime, I will be happy if I have laid the groundwork." Cullers further notes that there is a place for the serious SETI amateur in the radio astronomy field. "Many of the early discoveries in radio astronomy were made by amateurs," he says. Ohio State's Dixon, although not an amateur, agrees. "We've always felt we may not discover intelligent life," he says. "But we will discover a new natural phenomenon." □

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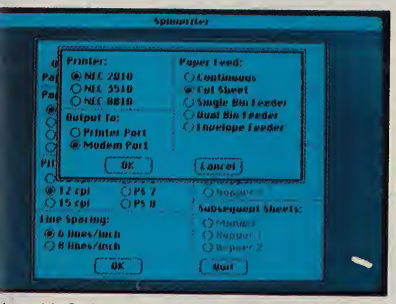

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The Apple IIc

Innovation or just a facelift for an old machine?

by Jonathan Sacks

When Apple Computer Inc. unveiled its sleek IIc at a dealer exposition in San Francisco last spring, the reception was a manufacturer's dream. The crowd, stirred to a frenzy by hype and anticipation, went wild over the new machine. In four madcap hours that day, Apple booked orders for 50,000 IIcs—the most stunning product introduction in personal computer history.

"We could have sold even more," says Ed Colby, marketing manager for the IIc. "We limited it to 50,000 because that was the number we knew we could deliver in the two months following the introduction."

Backed by a heavily financed ad campaign, the IIc has become one of the best-selling computers ever (see our Cover Story, June 1984). But after six frustrating weeks as a IIc user, I am mystified by that success.

Despite all the Apple hoopla telling us this is a modern-day miracle machine, I found the IIc to be just a second facelift for the Apple II Plus (the IIe was facelift #1). Cosmetic surgery is fine in some cases, but nothing short of major internal surgery will modernize the Apple II line.

So why then did Apple give us the IIc? Realizing the potential for stiff competition from Big Blue and the rest of the computer industry, Apple officials saw the need to glitz up their product line a bit—especially in the home market, their lifeblood. They did months of market research to determine precisely what buyers wanted in new computers. They found that we wanted smaller, simpler, and friendlier computers.

And that's what Apple officials told their engineers to make—with just a couple of strict limitations. First, this new machine had to be priced for the home market. Second, it had to run most of the software written for earlier machines on the Apple II family tree—specifically

Photograph by Paul Avis

Jonathan Sacks is a West Coast editor of *Popular Computing*.

he II Plus and the IIe.

From a marketing perspective, of ourse, software compatibility is ssential. As we have all heard so ften, a mountain of software is out here for the Apple II Plus and IIe omputers, including popular games, ome creditable business packages, and what many people consider to be the most comprehensive collection of educational software ever written. And Apple's track record has proved that a large base of good software sells computers.

But from a design perspective, compatibility is the IIc's Achilles' heel. To maintain that compatibility, Apple's engineers couldn't make the IIc very different from its predecessors. Instead, they settled for a sleek look and simplified electronics, which are the large-scale-integrated chips Apple is so proud of—chips that do little to improve the performance of the machine but a lot to reduce the manufacturing cost.

True, the IIc does boast some improvements over the II Plus and IIe, such as 128K bytes of random-access memory (RAM) and a built-in slimline disk drive. But the IIc suffers the curse of its bloodline. Its single-sided, single-density disk drive holds just 143K bytes of data, less than half the current industry standard and less than one-fifth that of advanced machines like the Tandy 2000. The limited disk size means that the IIc needs to be supplemented with an external disk drive for most business applications. And even then, there is often too little disk space.

This hereditary weakness is the result of a trade-off Apple made in the name of compatibility: the IIc uses a disk controller chip designed by Steve Wozniak in 1978. Apple engineers have failed to solve the compatibility problem in a cost-effective way. "We don't like it any more than anyone else," Ed Colby says. "But we're at our wits' end about what to do to improve it."

Credit the people at Apple this much: their new versions of the Apple II get a *little* better each time. You see the impact of market research on the IIc the moment you unpack the machine. The computer's ports are labeled with icons so that the IIc system can be set up in minutes. The IIc comes with six interactive on-disk tutorials so that even a newcomer to computers can learn to use it in a couple of hours.

In appearance, the IIc stands in

AT A GLANCE: Apple IIc

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Uses:	Home, education, and small business
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Documentation:	Manual with five disks that include six interactive tutorials: Keyboard Introduction, Apple at Play, Apple at Work, Introduction to Logo, Getting Down to BASIC, and The Inside Story
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elegant contrast to its clunky forebears. The system unit—which houses the electronics, the disk drive, and a full keyboard—weighs just 7½ pounds and is about the size of a standard three-ring binder.

The system unit also has two new switches located above the keyboard. One shifts the screen display from 40 to 80 columns, though the IIc uses a mushy character set that is hard on the eyes—an Apple II family trait. The other switch changes the keyboard from the standard QWERTY layout to the Dvorak layout, which is said to be easier for newcomers to learn.

The IIc keyboard includes the Open Apple/Closed Apple soft function keys. These keys, also on the IIe, can be programmed in software applications to perform command functions when they are pressed in combination with other keys.

Apple plans to offer a snap-on flat panel LCD (liquid crystal display) that will display 24 lines by 80 columns of text as well as high-resolution graphics. The LCD was supposed to be out late in 1984, but because of problems interfacing it with the IIc video output, release has been delayed. Until that panel is available, the IIc must be connected either to a television set (with an RF modulator that comes with the system) or to a IIc monitor ($199).

Apple designed the IIc so it could be carried about. A handle attached to the back of the plastic case makes the system unit itself comfortably totable. (The IIc handle also serves as a fold-down support that tilts the system unit and allows cooling air to circulate underneath the machine.) But the IIc's external power supply with its dangling cables can be cumbersome. The complete IIc (system unit, power supply, monitor or RF modulator, and the connecting cables) is actually hard to carry.

Functionally, however, the IIc is barely different from earlier machines in the Apple II series. Even though custom-designed large-scale-integrated circuits have reduced the electronic components to just the microprocessor and 21 support chips, to the user, the circuitry acts the same as that in the II Plus and IIe.

The IIc is built around a 65C02 microprocessor, an updated version of the 6502 chip central to the earlier Apples. The "C" in 65C02 stands for CMOS (complementary metal-oxide semiconductor), meaning the chip requires less power and generates less heat. The 65C02 offers 27 new instructions that add versatility for programmers but make little difference to the rest of us.

The IIc also sports the high-resolution graphics that were first introduced in the IIe. That makes it a fun machine to play games on, but so far—perhaps because graphics are RAM-intensive and earlier Apples came with only 64K bytes of RAM—only a few games take advantage of the high resolution.

Finally, some design changes left me wondering. Most striking is that the IIc is a closed system. The computer has ports to connect a monitor, a serial printer, a mouse or game controllers, an external disk drive, and a modem—but that's it.

You cannot add expansion cards, not even one that would allow the IIc to run CP/M. That limits your choice of business software, but there is more to it than that. The II series is popular in part because people can add specialized controller cards—to turn lights off and on or play music or control a burglar alarm, for example. The IIc can't use any of those cards. In fact, opening the IIc case voids the warranty.

Apple claims the IIc can run an estimated 90 percent of the thousands of programs written for the II Plus and IIe machines, a big selling point. But what about the hundreds of programs that make up the other 10 percent? The major compatibility complaint has been about programs that display capital letters in inverse graphics display mode. A design change to accommodate a mouse and Macintosh-like icons allows only the display of symbols, not inverse letters.

Other problems have cropped up with programs that, in Apple's words, use "unapproved" memory locations—bits of memory that exist in the earlier Apple computers but are not documented or reserved for future use. "Good programmers sometimes discover these locations and use them," explains David Seuss, president of Spinnaker Software. "Many programmers did that with programs written for the II Plus and the IIe. Then, Apple did away with those little bits of silicon in the IIc, and now the programs that addressed them won't run properly."

Its single-sided disk drive holds just 143K bytes of data, less than half the current industry standard and less than one-fifth that of advanced machines.

Much of the software that suffers compatibility problems is being rewritten to run properly on the IIc. But some—including a few from Spinnaker—are not.

Yet, the IIc's greatest strength is its software. If you are excited about all the programs written for the Apple II Plus and IIe—especially if you want to take advantage of the many educational programs—the IIc might be your kind of computer. Just remember to check whether it will run your favorite programs.

On the other hand, if sleek looks are not important, you might consider buying a used Apple II Plus or IIe. There are plenty of them around, and for a fraction of the price of a new IIc, you can run more software.

The IIc isn't a bad computer. It's just a computer based on aged technology. And at its current price of $1200, the IIc is in the wrong league. At $700, it would certainly be a steal. □

The Sanyo MBC-555

A low-cost MS-DOS system competes with the IBM PC

by Terrance Geary

Sanyo is confident that its MBC-555 can compete with any machine in the personal computer market, including the IBM PC. With 50,000 units sold in the first seven months and 100,000 sales projected by the end of 1984, the company's not just whistling in the dark.

The MBC-555 is Sanyo's latest entry into the personal computer market. This Japanese firm has introduced seven computers in the U.S. since 1981, of which five have been Z80-based CP/M systems. Prospects for the CP/M market are shrinking, however, and Sanyo is looking for greener pastures.

According to Ron Milos, formerly Sanyo Business Systems' manager of marketing, the 8-bit computers that use the CP/M operating system are taking a beating from 16-bit computers that use MS-DOS because CP/M does not offer enough recreational software. (Sanyo market surveys indicate that personal computers are used for nonbusiness purposes fully 50 percent of the time.)

Enter the 16-bit MBC-555 with its MS-DOS operating system and bundled business software. MS-DOS allows the MBC-555 to run popular recreational software from publishers such as Norell Data Systems and Infocom. Sanyo combined those features with a low price tag to offer what it believes is the best price/performance package in the marketplace.

The MS-DOS-compatible Sanyo MBC-555 is bundled with word-processing and spreadsheet software.

Photograph by Tom Madura

First Impressions

The $1299 base price buys you a handsome silver-gray keyboard, a system unit, and a nice bundle of business software. The system unit measures 15 by 14⅖ by 4⅖ inches. It holds an 8088 microprocessor, 128K bytes of RAM (random-access memory), two single-sided drives, an 8-color graphics board that provides a 640 by 200 pixel resolution, and monochrome and RGB color monitor ports. The MBC-555's bundled software includes MS-DOS version 1.25, Sanyo proprietary BASIC, Wordstar, Mailmerge, Spellstar, Infostar, Calcstar, and

Easywriter. (Sanyo also offers the system with two double-sided drives, MS-DOS version 2.1, and GWBASIC for $1499.)

The start-up is easy. The keyboard and monitor plug into the rear panel of the unit. An RCA-type phono plug connects the video output of the computer to the monochrome monitor—an 8-pin connector is provided for the RGB color monitor. A standard parallel printer connects via the parallel port, and the power cord plugs into a wall outlet. I had the system running in 10 minutes.

The MBC-555 has a 61-key typewriter-style keyboard, a 19-key numeric pad, and five function keys. The keyboard base contains a tilt feature that lets you position it at a slight angle for comfort. Both the Caps Lock key and Graphics key have red LEDs (light emitting diodes) that indicate when the keys are on. A reset button is tucked safely away on the side of the keyboard in the top left corner of the case.

The keyboard offers several features that a touch-typist will appreciate. The home keys (F and J) have deeper indents than the rest of the keys. Also, you get a reassuring mechanical clack from the keyboard when the keys are pressed, and a two-key rollover feature allows you to press a second key before releasing the first. Finally, the keyboard buffer holds 16 characters, which allows you to continue typing while the computer is busy with menu changes or screen rewrites.

The numeric keypad, always a useful feature, contains the 10 number keys, the double 0, the decimal point, all algebraic operators, the Return key, and the Break key. The numeric pad also contains the cursor control keys, although cursor control is actuated by the Num Lock key on the main keyboard. This is the same arrangement found on the IBM PC. Because the cursor keys are actually software controlled, they are not functional in Calcstar.

The left side of the keyboard contains five function keys that, when used with the shift key, store up to 10 software-designated functions. Both Sanyo BASIC and Wordstar use the function keys.

Terrance Geary is a freelance writer and quality control manager living in Erie, Pennsylvania.

IBM PC Competitive

The MBC-555 is billed as IBM PC compatible, but it's more IBM competitive than compatible. The MBC-555 will not accept expansion boards, nor will it run all of the software written for the IBM. Moreover, fundamental differences between Sanyo and IBM graphics will never allow them to be completely compatible.

First, video RAM is located in a different memory address on the MBC-555. To further complicate matters, Sanyo uses a completely different approach to writing graphics than IBM. Sanyo uses three planes, or screens, for writing characters to video. The screens correspond to the red, green, and blue primary colors, and pixels are assigned to locations according to their color. The IBM PC does not use such screens. Resolution and color differences aggravate the situation. IBM has only four colors and a 320 by 200 pixel resolution, and programs written for that format do not mesh with the 8-color, 640 by 200 pixel resolution of the MBC-555.

Even without graphics, software written for the IBM PC may not run on the MBC-555 for several reasons. Some programs written for the IBM PC depend on the direct memory access (DMA) controller to store information at a specific location in RAM. The MBC-555 does not have a DMA controller and may not put that information in the same location.

And if all that is not bad enough, Sanyo BASIC is not compatible with the IBM PC's BASICA. Of course, this problem could have been avoided had Sanyo opted for Microsoft's GWBASIC instead of a proprietary version.

Hardware compatibility, on the other hand, may be down the road. Although the MBC-555 does not have any expansion slots, it does have a 62-pin connector on the main board that ties into Sanyo's proprietary I/O bus. Sanyo is working closely with TW Technologies of Arizona on an IBM PC-compatible expansion box that will utilize that 62-pin connector. According to Bob Thompson, president of TW Technologies, the expansion box will have 8 slots that accept IBM cards for memory expansion, a serial port, and a clock/calendar. It will have its own power supply and cost less than $1000.

AT A GLANCE: MBC-555

Manufacturer:	Sanyo Electric Company, Ltd., Japan. Distributed in the United States by Sanyo Business Systems Corp., 51 Joseph St., Moonachie, NJ 07074, (201) 440-9300
Uses:	Personal computing for home and small-business applications
Standard Features:	Intel 8088 16-bit microprocessor; full-size 61-key typewriter keyboard with 19-key numeric pad, 8-key cursor control, and 5 special function keys; 128K bytes of RAM (expandable to 256K bytes); dual 5¼-inch single-sided, double-density disk drives; Centronics printer port; speaker; joystick port; RGB monitor port; monochrome monitor port; 62-pin main-board connector for peripheral expansion support; MS-DOS version 1.25; Sanyo BASIC; Sanyo Graphics with 8 colors and 640 by 200 pixel resolution; Easywriter; Wordstar; Spellstar; Mailmerge; Infostar; Calcstar
Base List Price:	$1299; $1499 for system with double-sided drives and MS-DOS 2.1
Documentation:	Sanyo *User's Guide*; Wordstar, Infostar, Spellstar, Mailmerge, Calcstar, and Easywriter training guides
Options and Accessories:	RGB color monitor, $749; 128K-byte RAM expansion (in 64K-byte kits), $120 per kit; RS-232 serial interface, $100
Typical System Price:	$1839 (includes system with double-sided disk drives, 256K bytes of RAM, and RS-232 serial interface)

Surprising Benchmarks

I tested the MBC-555 against the IBM PC for speed in file handling. (See "Benchmark Program for File-Handling Operations," below.) The test program was written in BASICA for the IBM PC and Sanyo BASIC for the MBC-555. The results reflect differences in both the hardware and the architecture of the two versions of BASIC.

The test program timed the speed at which disk files are written, read, and deleted. The MBC-555 completed the program in 9:42 minutes while the IBM PC took 15:10—an impressive victory for the MBC-555. But then, to check the impact of writing to the display, I added a simple print statement ("Print J") to line 150 of the file-handling program. This time, the IBM PC beat the MBC-555 by 2:45 minutes (20:01 vs. 22:46). Of course, writing to the display always slows a BASIC program, but why did the MBC-555 slow down so much?

The documentation that comes with the MBC-555 is poor. Ron Milos was given only three weeks to write the *User's Guide* and did not get a chance to proofread it.

According to Sanyo, the problem is the result of using the 8088 central processing unit (CPU) to write characters from the character generator to the video RAM. In most systems, the display controller does much of that work, freeing the CPU for more important tasks. The display controller in the MBC-555 is not available for this task because it is dedicated to the graphics board. Why did Sanyo choose to sacrifice the speed of the display controller for text writing? Frankly, because it saved on circuits and helped keep the price down.

The effect of this arrangement on software is most obvious when using Wordstar. During scrolling, each line is continually rewritten, which makes the program very slow. This problem does not affect the speed at which you can type; the keyboard buffer allows you to operate well ahead of the screen without losing characters. It does, however, become an irritant when you are editing because you have to wait for the lines to be rewritten. And even worse, the rewrite causes a ripple effect on the screen, which makes reading during the rewrite impossible. (Fortunately, the authors of Easywriter coded their program in such a way that it truly scrolls, rewriting only the last line of text on the screen.)

Speed is not the only problem with Wordstar on the MBC-555. A bug in the program causes "(Vp6w6n?" to be printed whenever the Num Lock key is depressed. That can ruin your whole day when you're typing a lot of numerical data in Wordstar. Sanyo says it has solved the problem and will send updated programs to existing customers.

Documentation Alternative

The documentation that comes with the MBC-555 is poor. Ron Milos was given only three weeks to write the *User's Guide* and did not get a chance to proofread it. The result was a manual that was too cursory to be helpful and peppered with errors and omissions. To top that off, there was a miscommunication between Sanyo U.S.A. and Micropro Japan.

When Sanyo requested manuals for the Micropro products that are bundled with the MBC-555 (Wordstar, Infostar, Mailmerge, Spellstar, and Calcstar), they received manuals written for Sanyo's CP/M-based computers (and without realizing it, sent them out with each system). Such are the vagaries and tribulations of trans-Pacific business.

Thankfully, you do not have to rely on Sanyo's *User's Guide*. Peter Norton's book *MD-DOS and PC-DOS* offers everything you need to know about the operating system, and Fred Zurofsky's *MBC-555 Series Personal Computer Handbook* fills in much of the missing information and corrects most of the errors in the *User's Guide*. (My dealer was so frustrated with the poor documentation supplied with the MBC-555 that he *gave* me Zurofsky's book.)

The Final Word

Despite its few shortcomings, this low-cost system from Sanyo is one of the best price/performance packages in the marketplace. In fact, the price of the MBC-555's bundled software, if purchased separately, would rival the cost of the complete system, and that system gives you the same features offered on many machines that cost twice as much and more. But if you need IBM PC compatibility, you had better stick with IBM. □

Benchmark Program for File-Handling Operations

This basic program opens a file named TEST.1, prints 100 lines of 80 asterisks, closes the file, erases it, and then repeats the process 99 times.

```
10  rem Benchmark for file
    operations
20  rem
30  CLS
40  CL$ =CHR$(26)
50  BELL$= CHR$(7)
60  PRINT BELL$; "START TIM-
    ING HERE"
70  FOR I=1 TO 100
80  A$ = STRING$(80,"*")
90  OPEN "O",1,"TEST.1"
100 PRINT CL$
120 PRINT "STARTING LOOP"; I
140 FOR J =1 TO 100
150 PRINT #1,A$
160 KILL "TEST.1"
170 NEXT I
180 PRINT BELL$;"END OF
    TEST"
190 END
```

To check the impact of writing to the display, line 150 was changed as follows:

```
150 PRINT #1,A$:PRINT J
```

Actual size: 1⅝"H x 6"W x 8½"D

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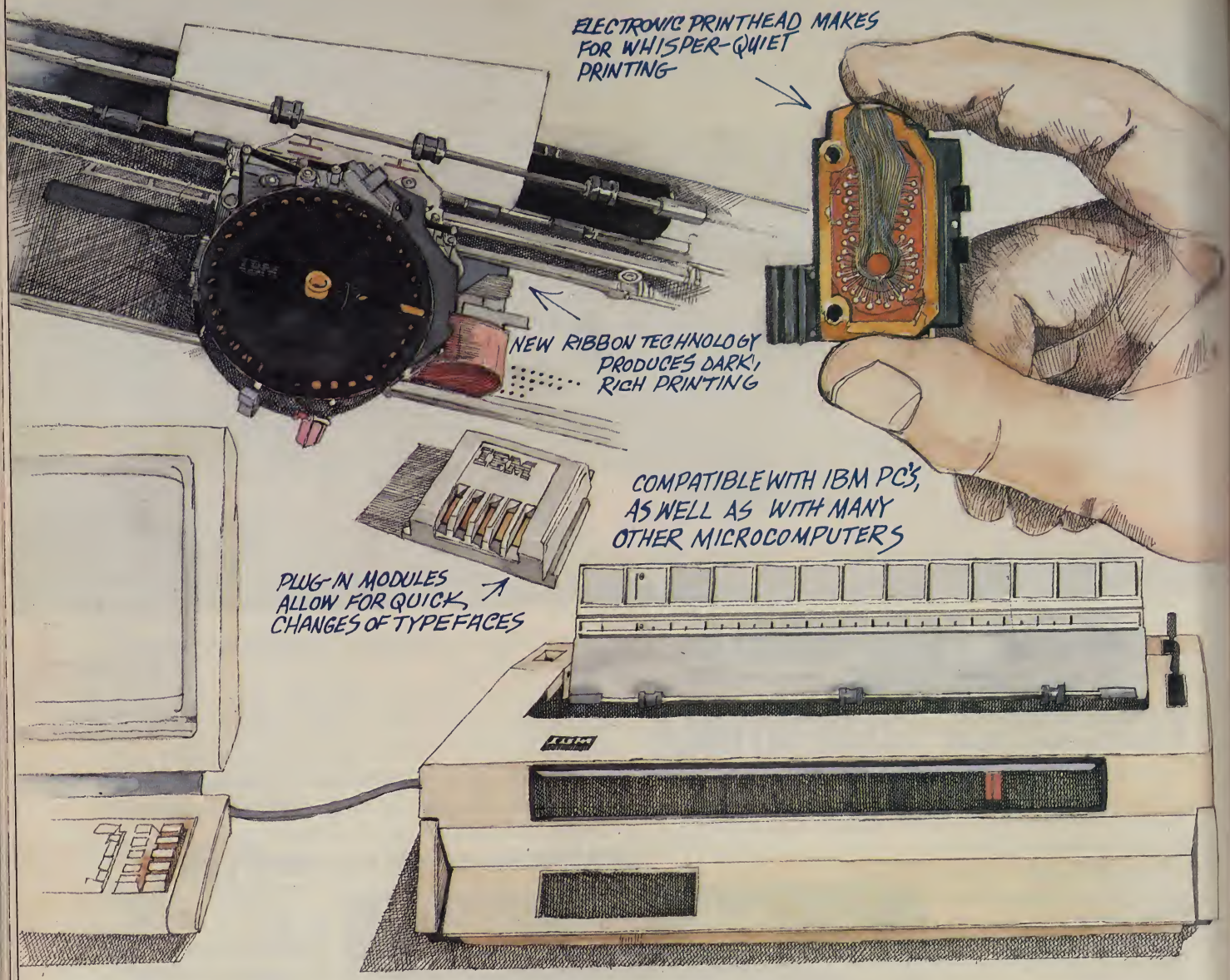

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Inquiry 36

VideoShow Hones Your Image

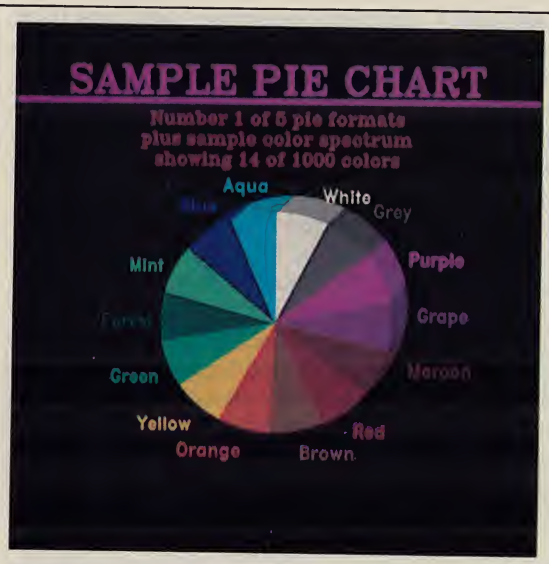
Creating and showing presentation-quality graphics is a snap

by David B. Powell

Dramatic slides or other visual aids have become an inseparable part of today's business presentations, as anyone who has sat through one in the past couple of years can attest. Unless you've been involved in the preparation of such a show, however, you probably have little idea of the cost and consternation that underlie the seemingly effortless final result.

Because in-house facilities for creating presentation-quality images typically yield results that are somewhat less than spectacular, most business people responsible for coming up with visual aids rely on outside production houses that charge anywhere from $30 to $100 per slide. Using outside services also demands greater lead time, making last-minute adjustments impossible.

But times are changing. VideoShow, a new hardware/software system from General Parametrics Corporation, could revolutionize the way presentation-quality graphics are created and displayed. The software side of the system, a $595 graphics program called PictureIt, gives you a wide selection of predesigned chart, graph, and text formats, 1000 colors to choose from, and, thanks to a proprietary technology called MacroVision, a big boost in screen resolution. Graphics created with PictureIt can be turned into standard slides, or you can use the portable VideoShow hardware unit to display floppy-disk-based images on a color monitor or large-screen video projection system. The $3499 VideoShow console, essentially a 256K-byte, 8086-based graphics computer, can even feed your images to a videocassette recorder.



Looking Sharp
The main heading of this sample VideoShow pie chart illustrates text that is shadowed, serifed, outlined, and underlined. The centered subhead uses only the shadow and serif options. While wedge labels are used alone in this image, you could also enter and display the underlying raw data as well as the percentage of the whole each wedge represents.

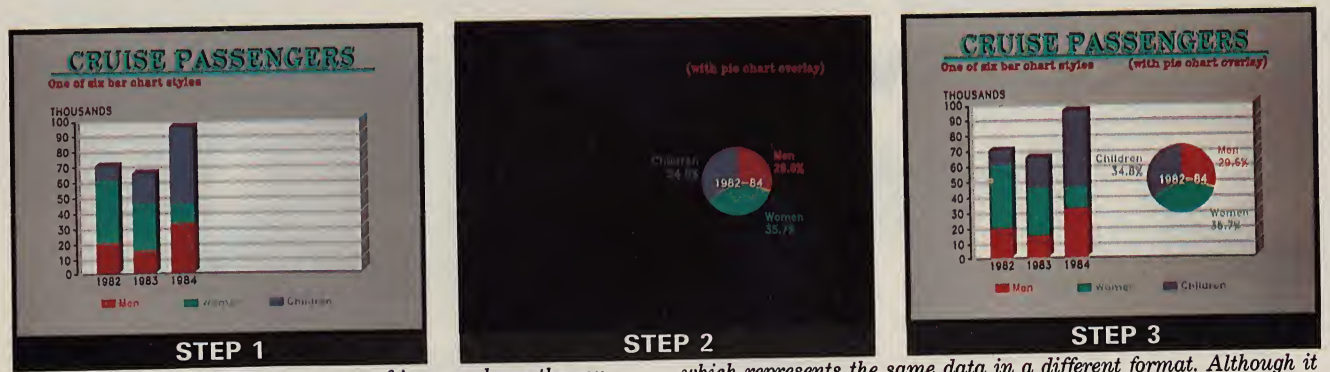
Creating an Image

The PictureIt graphics program runs on a 128K-byte IBM PC or compatible computer, which you use for entering the information you want to display. To begin creating an image, you merely indicate which one of the program's 25 graphics formats you want to use.

Eight of the formats are for histograms and horizontal or vertical bar charts. These formats feature effects such as shadowing; 3-D bars; grouped, stacked, or overlapped bars; and as many as 19 bars in 19 different colors. Four line-graph formats will handle up to three lines, each connecting as many as 18 data points. You can highlight differences between graphed lines by filling the areas between or below them with contrasting colors, and you can even opt for a format that will plot two lines on different vertical axes.

Five pie-chart formats give you the flexibility to put up to four charts on one screen, divide the pie into 14 wedges, create 3-D and exploded-pie images, and display numerical data, percentages, and labels. And PictureIt reserves eight formats for text slides, that most

David B. Powell, a frequent contributor to *Popular Computing*, runs Wordframe in Winchester, Massachusetts. He extends special thanks to Erich Whitney for his help in testing VideoShow.



Double Your Impact—*This sequence of images shows the construction of a two-slide overlay. In step 1, four phantom bars of color "none" are entered to the right so that the visible bars are pushed to the left. Step 2 shows the creation of the overlay image, which represents the same data in a different format. Although it appears as black, the background color is actually "none." In step 3, the pie chart overlays the bar chart to produce this doubly informative graphic image.*

popular business-presentation medium. These feature proportionally spaced headlines, subheads, and small, medium, or large text. Your text can be flush left, flush right, centered, justified, serifed, shadowed, outlined, or underlined. One format even accepts real-time commands for highlighting parts of the screen during your presentation. You can also enhance the visual appeal of any format with one of 20 preprogrammed backgrounds.

Once you've selected a format for the information you want to display, you call up the program's menu for entering that information. A short form of this menu asks only for the bare minimum, relying on default parameters for the rest. The long form lets you specify everything down to footnotes, giving you maximum control of the final image. Either way, you can preview your graphics by connecting the VideoShow console to your IBM PC or compatible unit and channeling the system's output to a color monitor.

But it's not the well-designed formats, the easy-to-use menu commands, or the availability of 1000 colors that sets PictureIt apart from other presentation-graphics programs. The truly significant advance is a technology called MacroVision. This surprisingly simple technique effectively *triples* horizontal resolution, yielding 2000 pixels even on the IBM PC you use to design your images. It works like this.

In most color monitors, each pixel is a triad of three phosphor dots—one red, one green, and one blue. With each one treated as a unit, the triads typically create up to 16 colors with approximately a 700-pixel horizontal resolution. MacroVision, however, treats each triad not as a unit but as three separately addressable microdots.

To get a general idea how this works, visualize a group of nine screen pixels containing 27 phosphor dots—nine red, nine green, and nine blue. By activating zero to nine dots of each color, the system is able to create 10 distinct intensities of red, 10 of green, and 10 of blue, which are variously combined to create 1000 apparent tones. The human eye—which is easily fooled in these matters—blends these complex mosaics of phosphor microdots into solid colors.

This technique boosts apparent screen resolution because boundaries between different colors can be delineated in microdot, rather than pixel, increments. The resulting images look as sharp as those produced by graphics hardware costing 10 times as much. One interesting side effect of the MacroVision technique is that some colors will look textured because they are combinations of both activated and unactivated phosphor dots.

Show Time

The VideoShow hardware unit does far more than just display your graphics on a color monitor. In essence, it can be characterized as an electronic slide projector.

The system stores images created with PictureIt on a standard 5¼-inch

AT A GLANCE: VideoShow

Manufacturer:	General Parametrics Corp., 1505 Solano Ave., Berkeley, CA 94707, (415) 524-3950
Uses:	In-house development of presentation-quality graphics images
Standard Features:	VideoShow hardware: 8086 microprocessor, 256K bytes of RAM, 16K bytes of ROM, RS-232 serial interface, IBM-compatible 5¼-inch floppy-disk drive, built-in 23-key touch pad, infrared wireless remote control, NAPLPS compatibility; PictureIt software: runs on any IBM-compatible computer with 128K bytes of RAM; features 25 stock formats, 1000 colors, and long-form and short-form menus for entering data; entire system requires an IBM PC-compatible computer with a minimum of 128K bytes of RAM, two floppy-disk drives or a hard-disk drive, monochrome or color monitor, and serial interface
Documentation:	Four-color *User's Guide*; disk-based Electronic Guide to PictureIt, VideoShow tutorial, and PictureIt help screens
Base List Price:	$3499 for VideoShow hardware console, $595 for PictureIt graphics software

floppy disk. Because VideoShow stores only the commands needed to recreate your graphics—rather than memory-hogging full-screen bit maps—as many as 400 images can be stored on a single disk.

When it comes time for the actual presentation, you have two options. In one method, you would use the VideoShow hardware unit to send images stored on a floppy disk to a composite or RGB color monitor, a large-screen video projector, or even an ordinary color TV. Because the VideoShow unit weighs only 16 pounds and you can store all but the longest presentation on a single floppy disk, this method of presentation has special appeal for business people going on the road to take the same show to a number of small audiences.

In this role as electronic slide projector, the VideoShow console lends a number of conveniences. You can control the presentation via the system's remote-control keypad, a wireless unit that communicates with the VideoShow console by infrared light signals (a backup keypad on the unit itself saves you from dead batteries or other snafus). You can change the order of your images and adapt your presentation for different groups with built-in software routines. You can display images in forward, reverse, or impromptu order and even overlay one image on another to build complex charts or tables in discrete steps. For a really classy presentation, you can have the system create wipes between images, like those on TV weather maps. A black or white on-screen pointer controlled from the keypad lets you emphasize parts of a projected image.

The second presentation option relies on standard slides generated from the high-resolution screen images you've created. In my work with VideoShow, I used an NPC Screenshooter (NPC Corp., 1238 Chestnut St., Newton Upper Falls, MA 02164), which is a light-tight cone that fits against the monitor and holds a regular 35mm camera at the narrower end. The Screenshooter was easy and fun to use, but to capture the full quality of VideoShow's high-resolution images, I had to send my image disk to General Parametrics, where the company used an experimental camera to create the slides that illustrate this article. At press time, this specially adapted camera was just being released by the company. Called the PhotoMaker 150, it is an enhanced version of Polaroid's Palette that retails for $2999.

PictureIt graphics software (top), the VideoShow hardware unit (center), and infrared remote-control pad (foreground) work with IBM PCs and compatibles.

In essence, the VideoShow hardware unit can be characterized as an electronic slide projector.

Pros and Cons

After working with VideoShow for several days, my strongest impression was that the system is easy—even fun—to learn and use. Before describing the pleasures of using VideoShow, though, let me point out the problems and limitations that invariably crop up with a new system.

PictureIt is a well-designed, flexible graphics program, but it's impossible to expect one program to handle everyone's graphics needs. It would be great if graphics software from other publishers could interface with the VideoShow hardware and, according to General Parametrics, "a number of software developers" are already working on interfaces to make their graphics programs compatible with VideoShow. But while the company welcomes such third-party support, it is not relying on it. Plans are already underway for a second version of PictureIt, which is likely to offer a wider selection of background styles along with formats for more specialized charts.

Until they learn what to expect, beginning PictureIt users may have problems with some formats. In pie-chart formats, for instance, labels, values, and percentages can overwrite each other when several small wedges are side by side. Alternating large and small wedges or using shorter labels circumvents this.

Similarly, text-format menus let you enter more characters than a finished image will hold. While the system does offer guidelines for line lengths in each of the text sizes, more precise limitations depend on the monitor or display device you'll be using. A little experience with your own system should be all you need to avoid this problem.

Also, I ran into a couple of bugs on the system I was testing. When I used the Graph 2 format, which highlights differences between line graphs by filling the areas between

the lines with color, the program was thrown off by extremely jagged line graphs. Because this happened only in the worst cases, I was willing to accept it as a limit of the system, but a General Parametrics spokesperson says the company has identified the problem and corrected it in version 1.1 of PictureIt.

Another small glitch sometimes caused the pointer to slide all the way across the screen image when I tried to position it at a precise location. According to the company, this probably happened because I was holding the infrared remote-control keypad *too close* to the VideoShow console—a controller closer than three feet overloads the system with signals, and the pointer was in fact programmed to make this jump in such circumstances.

As I've suggested throughout, VideoShow is a thoughtfully designed product that delivers on all of the manufacturer's promises. Several features make the product special. For simplicity's sake, you can select 24 of the 1000 colors by name (according to "Crayola Standard" names). But any color can be called up using a three-digit RGB code. These digits range from 0 to 9 and specify the amount of red, green, and blue mixed into the final color. For example, the code 900 produces pure red, 090 makes pure green, 009 outputs blue, 999 is white, 000 is black, and 555 is medium gray.

The Color "None"

This code makes it easy to adjust colors. If a shade needs more red, for instance, just add 1 to its first digit or subtract 1 from the green and blue digits. Actually, this ability to fine-tune colors is more than nice—it's necessary. A thousand colors is a great idea, but, depending on the monitor, some colors are downright unattractive and others don't provide adequate contrast. Thus the ability to adjust hues is crucial.

And I can't overestimate the system's single most useful color—"none." This is different from black, which is a solid color that obscures whatever is behind it. "None," on the other hand, is transparent; whatever is behind it shows through. This color has many important uses.

An image with a background color of "none" can overlay another, as illustrated on page 114. Although it looks black, the background in step 2 is actually "none," which allows it to overlay the first image. The "color" was also assigned to four "phantom" bars in step 1 so that the three visible ones would be pushed to the left.

Another handy use for the color "none" involves those formats that display line graphs with the areas below the lines filled in with color. To get a quick glimpse of the data that might be behind those filled areas, all you have to do is temporarily change the fill color to "none."

The Bottom Line

From a technical perspective, VideoShow is a fine product that seems destined to receive support from manufacturers of graphics software, not to mention continued support in the form of enhanced versions of PictureIt. But is it really worth its cost?

If you need presentation-quality images on a fairly regular basis, I'd say yes, it is worth the price. If we assume an average cost of $40 per slide for images developed by a specialty service, VideoShow will pay for itself after you've created 110 images to be displayed on a color monitor of average cost. If you include the PhotoMaker 150 to make slides of your images, you'll reach the break-even point at 178 slides. And these figures place no value on the convenience and flexibility of generating images yourself rather than sending them out. Organizations that routinely develop presentations based on standard graph, text, and chart formats could well find that VideoShow answers some prayers. □

Texas Instruments Pro-Lite

A notebook-size computer that's big on expansion

by Michael J. Miller

In the world of personal computers, Texas Instruments has always marched to the beat of a different drummer. So it's natural that when the firm turned its attention to creating a portable computer, it included a few features that were out of the ordinary.

TI's new Pro-Lite is similar to the new breed of portable typified by the Data General One. (See our December 1984 issue for a review of the Data General One.) The Pro-Lite has a 25-line by 80-column liquid crystal display (LCD) and a 3½-inch microfloppy-disk drive, and it weighs 10½ pounds.

But the Pro-Lite offers several differences that set it apart from other notebook computers. It has a wide variety of options and more room for growth, and not surprisingly, instead of trying to make the machine compatible with the IBM PC, TI made it compatible with its own TI Professional Computer line. This last feature is not likely to gain many new converts from the legions of IBM PC users. But the Pro-Lite should appeal to TI's own customers.

With an optional graphics board, the Pro-Lite can display 640 by 200 dots.

A Closer Look

The machine measures in at 2½ inches high by 11½ inches wide by 13 inches long. A second disk drive ($595) adds another 5 inches of length and 3 pounds. (A battery pack adds another 4½ pounds.)

The machine is based on a Harris 80C88 central processor, a low-power complementary metal-oxide semiconductor (CMOS) version of the popular Intel 8088 that is used in the TI Professional and IBM PC. The $2995 base machine includes 256K bytes of RAM, which can be expanded to a total of 768K bytes.

The Pro-Lite LCD has a tilting mechanism that lets you set it to whatever angle is most readable. The screen has a viewing area of 9.4

Michael J. Miller is a West Coast editor of *Popular Computing.*

by 4.4 inches and displays the same amount of text normally shown on a TI Professional.

For graphics, it's another story. With an optional $150 graphics board, the Pro-Lite can display 640 by 200 black dots against a gray background. The TI Professional, on the other hand, normally displays 720 by 300 dots and three planes of color graphics. Since the Pro-Lite's LCD cannot show three planes of color graphics, only one plane (the one that displays blue on the TI Professional) is displayed when running color graphics software. Many programs, however, are designed to work just as well with either color or monochrome graphics.

Moreover, graphics programs work by turning on and off specific dots on the display, and the Pro-Lite does not have as many dots as the TI Professional. To overcome this limitation, the Pro-Lite shows a window (a 640 by 200 portion) of a larger (720 by 300) screen, allowing you to move that window, by hitting Shift-Alt and arrow keys, to see the whole picture.

Finally, because the Pro-Lite's screen is elongated, compared to a standard display screen, graphics are distorted—for example, a pie chart is displayed as an oval.

The Pro-Lite's double-sided 3½-inch disk drive stores 720K bytes of information—twice as much as the 5¼-inch drive on a TI Professional or IBM PC. TI claims the drive uses a standard MS-DOS format. Data General makes the same claim for its portable, but I could not get either portable to read disks formatted for the other.

The Pro-Lite has a 79-key keyboard that has a standard typewriter layout. The 12 function keys and space bar are somewhat smaller than normal. Cursor control keys occupy a line on the bottom right of the keyboard. In addition, TI has embedded a numeric keypad in the keyboard. You select the keypad by pressing a special key with a light that turns green to indicate you're working with the numeric keypad. The same key also turns red to indicate when the caps lock feature is on. This should reduce the chance of switching to "caps lock" or "num lock" mode accidentally, a problem on some computers. Adding to the system's compactness, the keyboard is recessed until the case is opened, causing the keyboard to pop up.

TI expects that third parties will offer specialized software modules for the Pro-Lite's option slots.

Noteworthy Options

Perhaps the most surprising aspect of the machine is its ability for expansion. And TI offers a variety of options that can be added to the machine via an expansion port, two special option slots, and an I/O slot for a full-size plug-in board.

The expansion port supports the battery pack, a second disk drive, and a cable that connects the Pro-Lite to a desktop computer. The battery pack ($129) runs for 5 to 8 hours per charge depending on how heavily you use the disk drives and modem. The pack is recharged through the adapter that normally powers the machine from an AC outlet.

Both disk drive and battery add ons include a continuation of the expansion port. This lets you add a cable to connect the Pro-Lite directly to a TI Professional or IBM PC. Once connected, the portable's disk drive acts as an extra disk drive for the desktop machine, allowing you to easily copy data and noncopy-protected programs from the desktop computer to the Pro-Lite's 3½-inch disks or back again.

The machine also contains two special option slots on the left side. Among the options TI now offers to fill these slots are a 300-baud internal modem and an RS-232 serial interface. In the future, a display adapter will allow you to connect the Pro-Lite to an external monitor and display 25 lines of text in color with three-plane graphics. TI also plans to offer a 1200-baud internal modem.

TI anticipates that third parties will offer "solid-state software modules" for the option slots. Such modules could contain up to 8 preprogrammed 32K-byte ROM chips. This arrangement would allow the

AT A GLANCE: The Texas Instruments Pro-Lite

Manufacturer:	Texas Instruments, Data Systems Group, POB 402430, Dallas, TX 75240; (800) 527-3500	
Uses:	Business and professional computing, particularly for people who need portability	
Standard Features:	80C88 central processor; 256K bytes of RAM, 80-column by 25-line liquid crystal display (LCD) with 640 by 200 pixels; 79-key keyboard with integrated numeric keypad; doubled-sided 3½-inch microfloppy-disk drive storing 720K bytes; parallel port, MS-DOS 2.12	
Base List Price:	$2995 (with 256K bytes of RAM and one disk drive)	
Documentation:	User's manual, *Getting Started* booklet, MS-DOS manual	
Popular Options:	Graphics board	$150
	300-baud internal modem	$300
	RS-232 serial port	$225
	Second disk drive	$595
	Memory expansion to 512K bytes	$595
	Memory expansion from 512K bytes to 768K bytes	$900
	Battery pack	$129
Typical System Prices:	$3740 (with 512K bytes of RAM, single disk drive, graphics board); $4464 (with 512K bytes of RAM, graphics board, dual disk drives, battery pack); $4980 (with 768K bytes of RAM, single disk drive, graphics board, modem)	

5 Ways Perfect Link™ Software Helps You Get the Business Information You Need. Faster and Easier.

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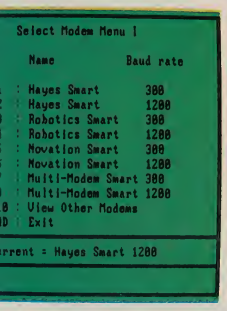

Perfect Link compatibility supports virtually every popular modem. Set up your modem once, and you never have to spend time setting it up again.

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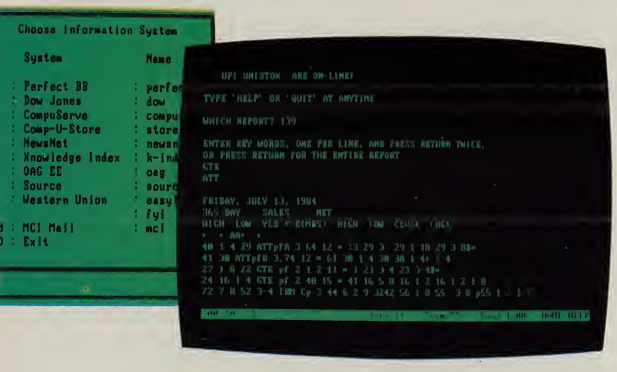
Touch a key and automatically dial and log-on to major services like Dow Jones. And The Source.℠ So the business information you need is right at your fingertips.



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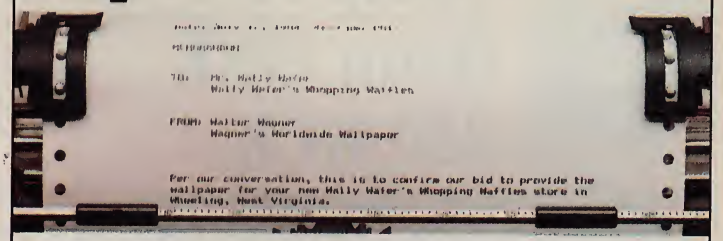

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software always to be resident in the machine. TI expects such modules will be used mostly to help market the machine for specialized applications.

In addition to the expansion port and the option slots, the machine is designed to accept another option board inside the unit. But even though many of the plug-in boards designed for the TI Professional will fit inside, they won't work because the boards require more power than the Pro-Lite can supply. Currently, TI has no plans to market any plug-in boards for the Pro-Lite, but the existence of the slot leaves a door open to third-party manufacturers.

Finally, Pro-Lite comes with a parallel printer connector so you can attach any standard parallel printer. TI plans to offer a $499 thermal printer that weighs 4 pounds and is powered by the Pro-Lite's battery.

Compatibility

The Pro-Lite uses small disks but otherwise is highly compatible with the TI Professional. Among the programs that I tested successfully on the Pro-Lite were the TI versions of Lotus 1-2-3, Wordstar, Multiplan, Multimate, Easywriter II, BASIC, and TI's natural language programs and telecommunications software.

The only drawback is that, first, you have to get the software on 3½-inch disks—a potential problem if the programs are copy-protected. Initially, TI will offer some of the best-known programs on 3½-inch disks, including Easywriter II, Wordstar, Multiplan, dBASE II and III, Electric Desk, Framework, and Volkswriter.

If you're more interested in compatibility with the IBM PC, you'll run into even bigger problems. Like the TI Professional, the Pro-Lite will run only a few programs written for the IBM PC and other MS-DOS computers. In most cases you'll need the specific version of the software that has been converted for the TI machines. About 600 such software packages are available for the TI Professional.

Pros and Cons

The Pro-Lite is the most expandable notebook computer I've seen on the market. And the machine is highly compatible with the TI Professional line.

On the other hand, the machine is designed to appeal to a limited market—TI's own customers. The lack of program compatibility may discourage most IBM PC users from even looking at the Pro-Lite.

Next, consider the weight factor. With dual drives and a battery pack, the Pro-Lite weighs in at 18 pounds, nearly as much as some of the so-called transportables. (A similarly equipped Data General One weighs about 7 pounds less.)

With its large memory, display, and room for expansion, the Pro-Lite is a technically sound machine. Most users of TI Professional Computers will find the Pro-Lite a welcome addition. But whether TI can sell the Pro-Lite to the vast numbers of other computer users and first-time buyers remains to be seen. ☐

What every Apple owner should know about

WORD JUGGLER™.

If you own an Apple IIe or IIc—or you're planning to buy one—here are a few things you should know about Quark's Word Juggler word processor.

First of all, Word Juggler is the only word processor that gives you a powerful spelling checker *and* a built-in telecommunications feature. So you can create a document—check it for spelling errors—and then send it via electronic mail. All with just one program.

Plus, Word Juggler is the most easy-to-use, professional word processor you can buy for your Apple. Virtually every function—even complicated "cut-and-paste" tasks—can be accomplished with a single keystroke.

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Fact is, no other word processor for your Apple IIe or IIc gives you this unique combination of power, functionality and ease of use. And if all these advantages aren't compelling enough, check the price. Suggested retail is only $189.

So visit your favorite dealer today. Ask for a complete demonstration—and for a copy of our brochure, "What Every Apple Owner Should Know About Word Juggler." If you don't have a favorite dealer, but would like one, just call 1 (800) 543-7711. We'll fix you up.

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Inquiry 61

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Ask about our specially-priced educational version.

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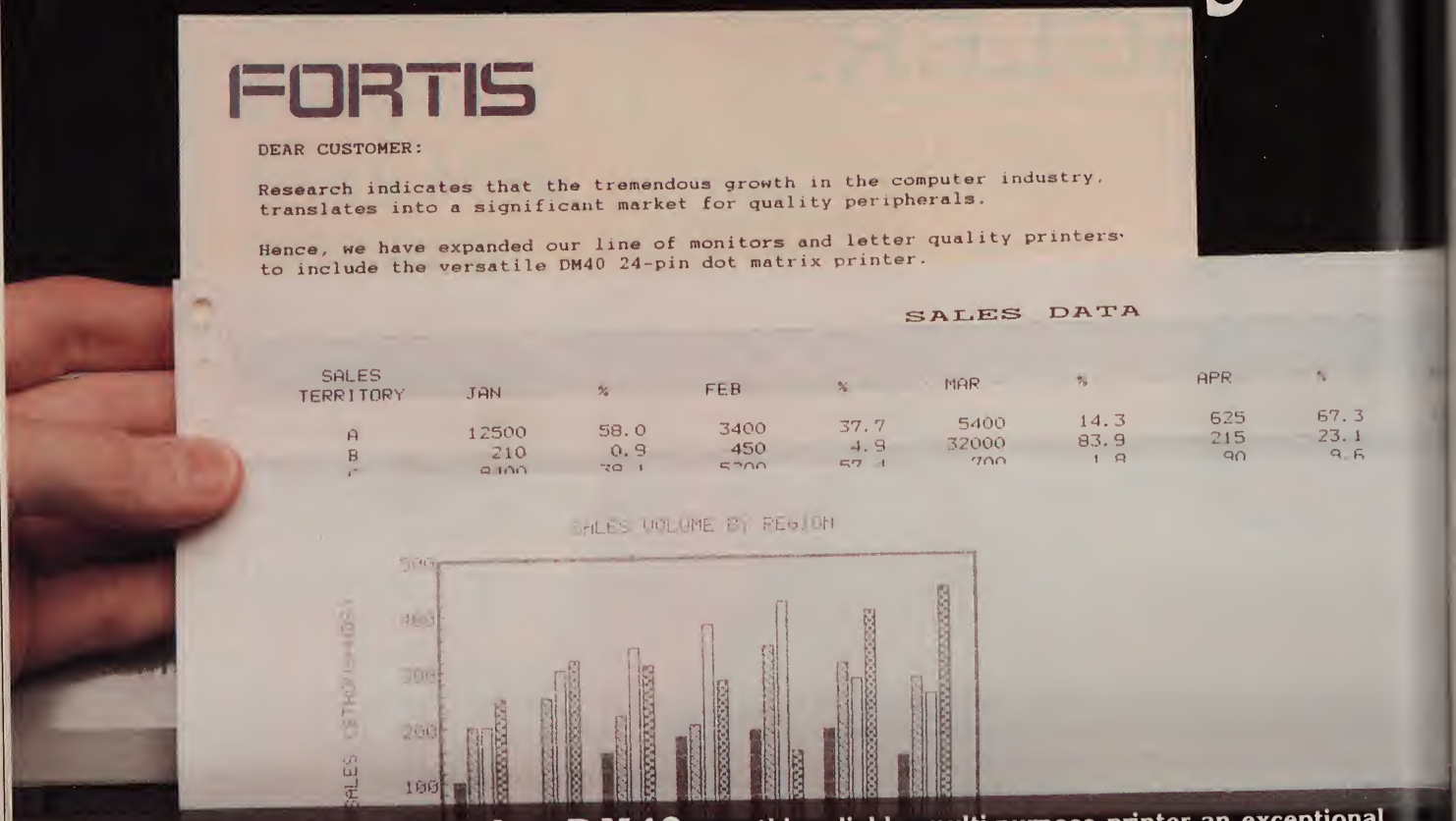
Show off Your Versatility



The Three In One Brother DM40

Whatever your printing needs . . . the DM40 can handle them. Great looking sales letters, 136 column spreadsheets and ultra high resolution graphics, all from this new DM40 dot matrix printer.

A new 24 pin print head takes advantage of the latest technology to produce a finer diameter wire pin. This allows for smaller dots resulting in sharper and crisper letters. The 24 pins also mean more dots to the inch for great graphics and letter quality images making this reliable, multi-purpose printer an exceptional value. The standard parallel interface is compatible with IBM* and other popular computers. A serial interface is optional.

At 160 CPS in draft and up to 96 CPS in letter quality mode show that this heavy duty unit is a real performer. Long print jobs are easy with the standard tractor feed. Optional sheet feeders (8½" and 14½" widths) are available.

Visit your dealer for a first hand view of this quality printer.

DM40 with optional Auto Cut Sheet Feeder SF-200

This photograph is only a representation of different types of output handled by the DM40.

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It's Sperry Portable

Sperry's new Portable offers IBM PC compatibility

The Sperry Portable Computer, a 38-pound transportable machine, promises operational compatibility with software and hardware designed for the IBM PC.

Based on an 8088 microprocessor, the system offers 256K bytes of RAM (expandable to 640K bytes), a 9-inch green-phosphor monitor, a detached keyboard, and parallel and serial interfaces. Other features include four IBM-compatible expansion slots, 640 by 400 resolution, and a socket for an optional 8087 arithmetic coprocessor.

The Sperry Portable is available in three models ranging in price from $2685 to $4985. The models differ in terms of floppy-disk capacities, hard-disk drive options, and number of expansion slots. Further details are available from Sperry Corp., Computer Systems, POB 500, Blue Bell, PA 19424.

Inquiry 200

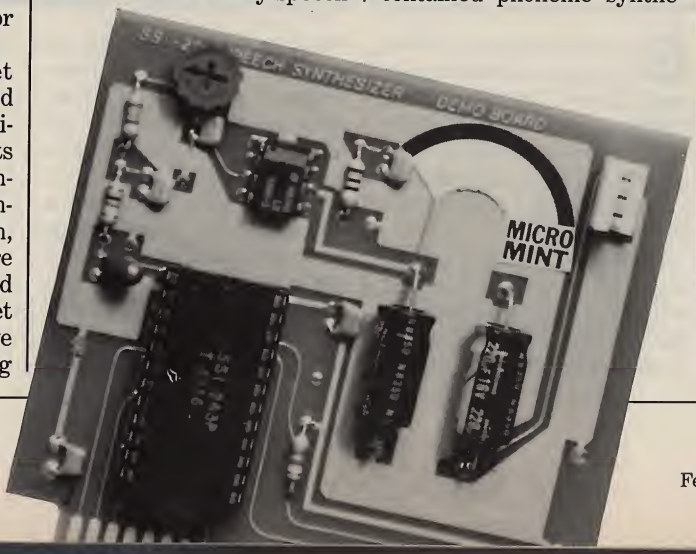
Sweet Talkin' Card

Sweet Talker II—an Apple II speech synthesizer

Micromint has introduced Sweet Talker II, a plug-in, phoneme-based speech synthesizer card for the Apple II and IIe.

Priced at $104, Sweet Talker II can be configured for various levels of intelligibility. At a rate of 400 bits per second, the card can synthesize human singing, complete with vibrato. Intonation, inflection, and filtration are all under your control, and phoneme values can be set dynamically on the card's five internal registers. Analog outputs are provided for music, sound effects, and unlimited vocabulary speech at data rates as low as 50 bits per second.

Sweet Talker II contains only a handful of components. Its SSI 263 CMOS integrated circuit is a completely self-contained phoneme synthesizer. The 24-pin chip works from a 3.59-MHz color-burst crystal divided by 2 or 4 or a 1- or 2-MHz clock base. It operates on a 5-volt power supply and has appropriate control inputs for connection to various computer buses or to a parallel interface. Hobbyists can modify the unit to work with a variety of personal computers.



Sweet Talker II, with demo software, text-to-speech algorithm, algorithm editor, and Diversi-DOS high-speed disk operating system, is available from Micromint Inc., 561 Willow Ave., Cedarhurst, NY 11516.

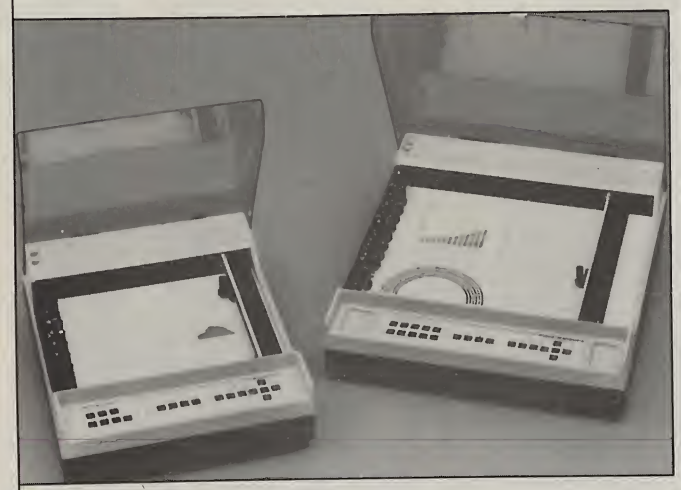
Inquiry 201

Colorwriter 6300

A pair of versatile graphics plotters

Gould Electronics has unveiled the Colorwriter 6300 Series, a pair of graphics plotters promising high performance, wide compatibility, and easy interfacing.

The Model 6310 uses seven pens to produce 8½- by 11-inch



charts, and the Model 6320 features 10 pens and yields an 11- by 17-inch chart format. Both units provide a full array of colors and several pen types, including fiber tips and roller balls in a variety of widths. An adapter accommodates Rotring or Pentel pens as well as specialized pens for producing graphics on transparencies, foils, and other clear media.

Colorwriter features include a writing speed of 16 to 20 inches per second, a 0.001-inch addressable resolution, RS-232C and IEEE-488 interfaces, and up to 16K bytes of internal memory. Also offered are variable line fonts, cross-hatching, bar- and pie-chart capabilities, arc and circle generation, character rotation and slant, and zoom and window controls.

Colorwriter 6300's built-in firmware provides a graphics language based on Hewlett-Packard protocols. The firmware offers three character sets, including upper- and lowercase drafting characters and a scientific Greek alphabet. Users can also access additional graphics standards with interchangeable PROMS.

Colorwriter 6300 prices begin at $1995. For additional information, contact Gould Inc., Recording Systems Division, 3631 Perkins Ave., Cleveland, OH 44114.

Inquiry 202

Eve II Portable Computer

The Eve II is a 14-pound Apple II-compatible computer with built-in monitor

The Apple II-compatible Eve II computer features a built-in 5-inch display screen and a detachable full-size typewriter-style keyboard with numeric keypad.

Featuring 6502 and Z80 microprocessors, Eve II is equipped with 64K bytes of RAM, two half-height 5¼-inch floppy-disk drives, and a 40/80-column display switch. The computer's twin processors support both Apple and CP/M disk operating systems.

Eve II, a 5-inch high, 15-inch wide, and 14½-inch deep unit, including power cables and a heavy-duty carrying case that will hold disks, manuals and cables, retails for $1595. More information is available from Computer Technology International Inc., 200 Murray Hill Pkwy., East Rutherford, NJ 07073.

Inquiry 203

Little Rascol

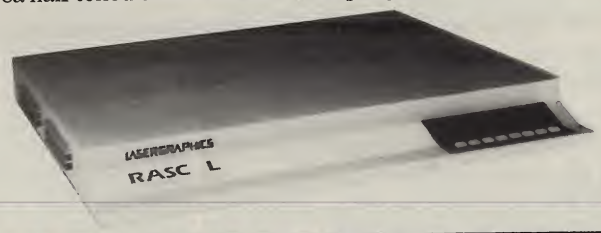
Rascol—a color graphics printer controller

Lasergraphics has announced Rascol, a color graphics printer controller compatible with most RS-232C-equipped computers and many color ink-jet printers, including the Diablo C-150 and Xerox 1770.

Essentially a dedicated graphics microprocessor, Rascol translates high-level graphics commands from the host computer into millions of color dots that drive the system's printer at full resolution and speed. The process produces documents with solid area half-toned colors instead of the limited line drawings produced by plotters. Because Rascol's printing time is largely independent of image complexity, even the most complicated images can be generated in only a few minutes. The unit doubles as a 200,000-character print buffer offering six fonts.

Rascol, which supports Lotus's 1-2-3 and many other graphics software packages, is priced at $1995. For additional information, contact Lasergraphics, 17671 Cowan Ave., Irvine, CA 92714.

Inquiry 204



Roving Peripheral

Nomad the Robot follows Commodore 64's orders

Genesis Computer has introduced Nomad, a personal robot for the Commodore 64. The educational tool is designed to illustrate and teach programming logic to children and other computer novices.

Priced at $179.95, Nomad is constructed with an aluminum chassis and a thermoformed plastic body. The unit is driven by stepper motors and can be commanded to move in four directions. Nomad's ultrasonic "eyesight" enables the robot to detect objects in its path or to perform ranging operations.

Nomad is controlled via a Robot Control Language that allows for complex movement and joystick control. An optional BASIC enhancement cartridge ($39.95) provides a complete selection of programming commands.

Nomad plugs into the Commodore 64's user (RS-232C) port and includes a 25-foot cable that allows movement within a typical classroom. The unit comes with its own power supply. Further details on Nomad and its uses are available from Genesis Computer Corp., POB 1143, Bethlehem, PA 18018.

Inquiry 205

Super Joy

Suncom's joystick provides three-button convenience

Tired of losing to the kids at arcade-type computer games? Suncom's reliable TAC-3 is a top-of-the-line joystick that provides faster, more accurate play for Atari, Commodore, and TI 99/4A owners.

Priced at $14.95, the unit offers two base-mounted fire buttons plus a third fire button on top of the joystick's handle. The TAC-3's bearing components are made of Delrin, one of the strongest plastics available. The unit features a beige base, a dark gray handle, and red fire buttons.

For more information, contact Suncom, 260 Holbrook Dr., Wheeling, IL 60090.
Inquiry 206

Clean Sweep

Microfloppy cleaner

The Vikor Flexible Head-Cleaning Disk removes ferric oxide contamination and other harmful residue from 3½-inch floppy-disk drives such as those on the Apple Macintosh.

Featuring a hard plastic case that opens automatically when inserted into the drive, the product cleans without abrasives and traps debris internally. Single- and double-sided versions are available. The single-sided disk is priced at $39.95.

More details are available from Vikor Co. Inc., POB 3123, Nashua, NH 03061.
Inquiry 207

Share and Share Alike

The Giltronix Peripheral Sharing Device

The Giltronix Peripheral Sharing Device enables as many as 14 computers to share a single peripheral without special cables. The unit, which is compatible with RS-232C-equipped computers, works with modems, printers, plotters, and most other serial-based devices.

Features include six front-panel LED indicators, a digital display of the selected port, and a slide switch at each port that allows users to set the correct DTE/DCE conversion. The unit also offers user-selectable time delays before dropping the connection and integral line drivers and receivers that increase network transmission distance and improve signal-to-noise ratio.

A three-port unit (for up to three computers) is priced at $395. Systems are also available for 5, 7, or 14 computers. Complete details are available from Giltronix, 3780 Fabian Way, Palo Alto, CA 94303. **Inquiry 208**

NEW PRODUCTS

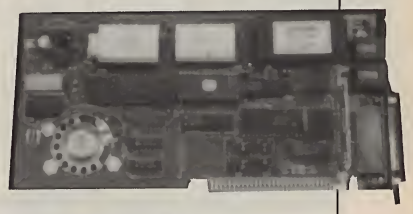
Cermetek 1200 PC Modem

A plug-in modem card for the IBM PC

Cermetek Microelectronics has introduced the Cermetek 1200 PC Modem ($495), a Hayes-compatible modem card for the IBM PC, PC XT, and compatibles.

The unit provides data-transfer speeds of 1200, 300, and 110 baud, auto-dial, auto-answer, auto-log-on capabilities, and tone and pulse dialing. Other features include call monitoring, built-in diagnostics, and automatic speed and parity selection. The unit requires only a single expansion slot and is shipped with Crosstalk XVI, a full-featured communications software package.

For more information, contact Cermetek Microelectronics Inc., POB 3565, Sunnyvale, CA 94088.
Inquiry 209



Toshiba America's Three in One

The P1351 printer offers downloadable fonts and a trio of printing modes

Toshiba America's new P1351 dot-matrix printer offers a choice of letter-quality, draft-quality, and dot-addressable graphics printing modes.

Priced at $1895, the unit provides a 24-pin print head, a 96-character ASCII set, and print speeds of 192 characters per second (draft-quality mode) and 100 characters per second (letter-quality mode). The 132-column printer also features a 180 by 180 graphics resolution, a variety of easily downloaded fonts, and Qume Sprint 5 emulation.

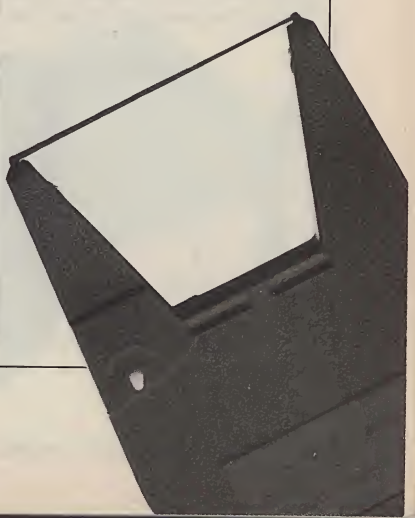
For complete information, contact Toshiba America Inc., Information Systems Division, 2441 Michelle Dr., Tustin, CA 92680.
Inquiry 210

Aspen Ribbon

A long-lasting ribbon for the Adam daisy-wheel printer comes in colors

Aspen Ribbon is a replacement nylon ribbon cartridge for the Coleco Adam daisy-wheel printer. According to its manufacturer, the 13-yard-long black ribbon lasts six to ten times longer than Adam's standard multistrike film ribbon.

Aspen Ribbon prices range from $3.75 to $6.50 each, depending on the quantity ordered. Red, green, blue, brown, and purple ink colors are available for an additional $2 per ribbon. For further information, write Aspen Ribbons Inc., 1700 North 55th St., Boulder, CO 80301.
Inquiry 211



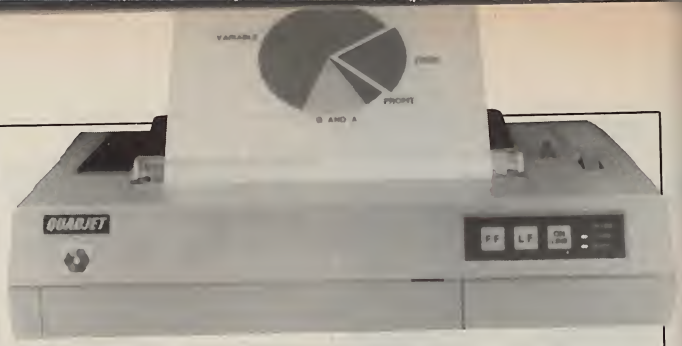
Shake, Rattle, and Roll

Audio-Technica insulators cut printer vibration

Audio-Technica AT605 Audio Insulators, originally designed to isolate phonograph turntables from acoustic feedback, also reduce printer vibration. The system includes four cylindrical energy absorbers, each of which is a multistage vibration/shock absorption device. The bottom of each brushed-chrome insulator features rubber projections of varying heights and diameters, giving greater support the heavier the printer. The insulators are priced at $27.95.

For more details, write Audio-Technica U.S. Inc., 1221 Commerce Dr., Stow, OH 44224.

Inquiry 212



Quadjet

A compact ink-jet printer

Quadram Corp.'s Quadjet is a compact, lightweight ink-jet printer that generates high-quality printouts in up to seven colors at 40 characters per second.

Priced at $895, Quadjet uses an advanced drop-on-demand ink-jet printing system that delivers a text or graphics resolution of 640 dots per line. The 12.3-pound unit offers standard- and enlarged-size characters, 40- or 80-column output, a snap-in ink cartridge system, and an almost unnoticeable sound level. Optional software accessory kits adapt Quadjet to IBM PC or Apple computers.

For more information, write Quadram Corp., 4355 International Blvd., Norcross, GA 30093.

Inquiry 213

It's Got the Smarts

CoSystem—an intelligent telephone for the IBM PC

Cygnet Technologies has introduced CoSystem, an intelligent telephone that connects to your IBM PC to provide a variety of voice and data functions.

On-board features include a built-in modem, 36 programmable function keys, simultaneous voice and data transmission, a real-time clock/calendar, a 400-name personal phone directory, automatic redialing, and speed dialing. A built-in Z80 microprocessor lets CoSystem dial on-line databases while unattended, automatically storing and transmitting data. The unit includes 64K bytes of dynamic random-access memory and 4K bytes of battery-backed-up CMOS memory.

Cygnet's CoSystem with a 1200-baud modem is priced at $1845; a 300-baud version sells for $1495. For additional details, contact Cygnet Technologies Inc., 1296 Lawrence Station Rd., Sunnyvale, CA 94089.

Inquiry 214

The Networker

Apple II modem

The Networker is a 300-baud modem card for the Apple II and IIe. The plug-in unit features originate and answer modes, manual dialing, and Hayes compatibility. Accompanying software provides on-screen menus, status indicators, a text buffer, and the ability to store downloaded data to disk. The Networker is priced at $129. For additional details, write Zoom Telephonics, 207 South St., Boston, MA 02111.

Inquiry 215

Mac's Modem

A high-speed modem for the Apple Macintosh

Pro Modem 1200M is a Hayes-compatible modem for the Apple Macintosh that offers data-transfer speeds of 300 and 1200 baud, an internal clock/calendar, built-in diagnostics, and auto-dial/auto-answer capabilities.

Other features of the $549 product include an internal speaker with volume control, tone and pulse dialing, programmable intelligent dialing, separate phone and data jacks, a Mac-to-modem connecting cable, and ProCom-M software.

Pro Modem 1200M is available with two handy options. A plug-in buffer card ($99) provides 2K bytes of RAM (expandable in 16K-byte increments to 64K bytes) that can be used to store clock/calendar data, operating parameters, and other information. A plug-in 12-character alphanumeric display ($99) shows the modem's operating status, diagnostic messages, phone numbers, and time/date information.

For complete details, write Prometheus Products Inc., 45277 Fremont Blvd., Fremont, CA 94538.

Inquiry 217

Protection for Portables Is in the Bag

The Portable PC Computer Bag affords style and security

The Portable PC Computer Bag provides IBM Portable PC, Compaq, and Kaypro owners with a secure way to transport their computers.

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For further details, write Kiwi, 6721 Northwest 36th Ave., Miami, FL 33147.

Inquiry 216

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Reference Magazine

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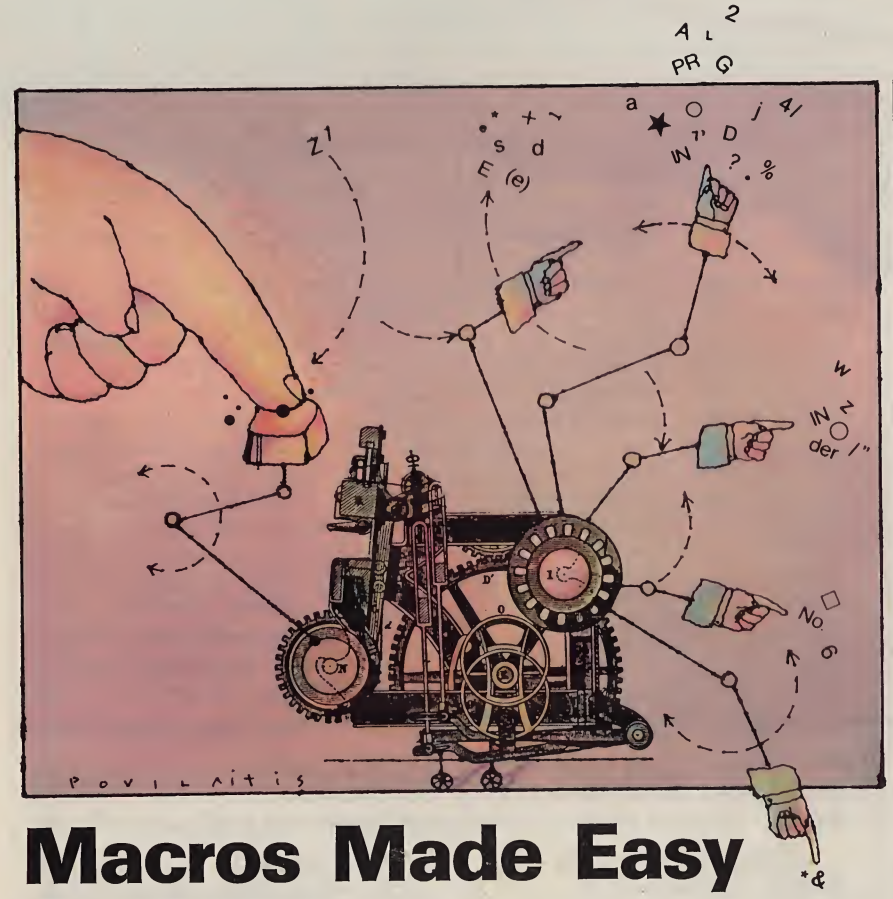

Macros Made Easy As 1-2-3

Lotus's 1-2-3 seems like a gift from binary heaven for anyone with an IBM-compatible computer, 256K bytes of memory, and heavy spreadsheet needs. Yet, too often, 1-2-3's powers are wasted because users fail to take full advantage of them.

One of the program's most valuable but probably least-utilized features is its macro capability. A macro is a series of stored keystrokes executed with the touch of two keys. Macros are timesavers that eliminate redundant typing and its potential for increasing errors. Macros also allow new 1-2-3 users to get to work quickly without having to hopscotch through the program's seemingly endless menus.

Unfortunately, most users figure that it's better to master 1-2-3's basic commands before attempting anything as complicated as a macro. Many believe that writing macros is programming—something to be avoided at all costs. But macros are quite simple—much easier than programming because there's really no new language to learn. Generally, 1-2-3 macros consist of the very same keystrokes users are already typing.

A Simple Macro

Here's a simple example that will help you start creating macros, even if you barely know the program. In 1-2-3, to blank out a cell entry, you must go through four keystrokes: / (the slash makes 1-2-3's opening menu appear), R (Range), E (Erase), and Enter. (To former Visicalc users all this work comes as a shock: to blank a cell entry in Visicalc, you need only two keystrokes.) But you can reduce the process to two strokes in 1-2-3 with a simple macro.

To create the macro, first move to a spreadsheet location you won't be using. We'll put our example in cell Z1. You must begin by typing a label prefix character, in this case the apostrophe ('). Now, type in the first three keys you'd strike if you were entering the command normally: /RE. To complete the sequence, hit the tilde key (~), the macro symbol for Enter.

Now hit Enter. In the upper left corner of the screen, you should see Z1:'/RE~. This confirms that the four-keystroke sequence, Menu, Range, Erase, and Enter, has been

Illustration by David Povilaitis

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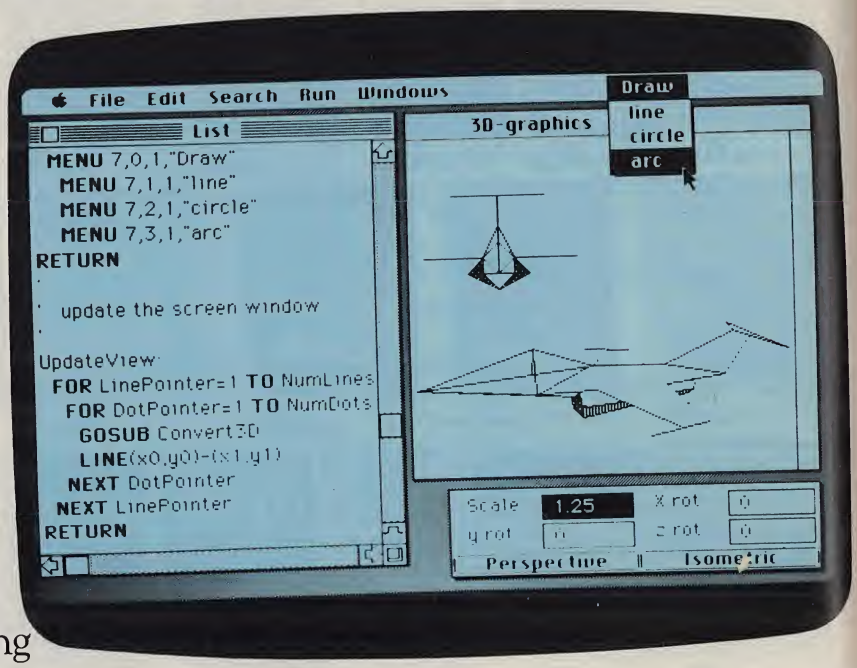

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stored on the spreadsheet.

Next you have to name the macro. With the cursor still in cell Z1, type: / Range Name Create.

Now 1-2-3 prompts you to supply the name. This must be done with the backslash character, then a letter. We'll call this macro "B" for blank. Type in \ B and hit Enter. Lotus responds with: "Enter Range: Z1..Z1". Since the macro is in cell Z1, just hit Enter again. Your macro is ready to go to work.

To invoke the macro, you must hit the Alt key together with the macro's one-letter name. Move the cursor to a cell you want to blank out and type Alt-B. The cell contents should now be blank. If it didn't work, see if your macro starts with a label symbol, and that you haven't mistaken the \ for /.

Inserting a Row

For a second example, let's create a macro that automatically inserts a row anywhere in your spreadsheet. Move to cell Z2. Type in '/WIR~ (' Label sign, / to activate the menu, W for Worksheet, I for Insert, R for Row, ~ for Enter) and then hit Enter.

Next, type /Range Name Create, then \ R Enter to name your new macro. Hit Enter again when prompted for the Range of your macro. Now, try it out. Move the cursor between any two rows and hit Alt-R to insert an additional row.

Suppose you wanted to write a macro that would activate 1-2-3's vertical titling mode. To execute this normally, you'd hit Home to send the cursor to the top left of your spreadsheet, then move it one cell to the right, and type /WTV (Worksheet Titles Vertical).

A macro will allow you to do the same thing with fewer strokes. But to tell it to move the cursor for you, the names of the directional keys must be typed letter by letter in parentheses. The same is true for Goto. Type this macro in cells Z4 and Z5: '{Home}{Right} '/WTV

This time the macro is written in one column. We could have strung everything across in a row, but it's better to work vertically with longer macros because they can be created in logical segments that are easier to see. Warning: don't leave any blank rows between cells—otherwise your macro will quit before finishing its work.

Move the cursor back to Z4 and name the macro with:
/Range Name Create

Call this macro: \ T. When 1-2-3 prompts for the range of the macro (Z4..Z4), hit Enter. With macros that extend beyond one cell, you need only enter the first cell of the Range. Hit Alt-T and see if the macro works.

Here's one final example to try out on your own. With it, you'll be able to change all consecutive column values into the currency format just by moving into the column and invoking the macro.

Type:	Represents:
'{End}{Up}	(End key, "up" arrow)
'/RFC~	(/ for menu, Range, Format, Currency, Enter)
'{End}{Down}~	(End key, "down" arrow key, Enter)

The End and "up" and "down" arrow are shortcuts for moving the cursor up and down columns.

As you might imagine, macros can get much more complicated. Loops, conditional statements, and interactive instructions that pause for user input can all be programmed into them. Although I don't have the space to tackle all these subjects here, I think this short tutorial has shown you how helpful even the simplest macros can be. You should now be able to turn to the 1-2-3 manual and create your own. Try it—you'll save time and effort.

—Seth Greenberg

Seth Greenberg is a television producer and freelance writer who also teaches courses in the use of popular software packages.

THE TECHNOKLUTZ CHRONICLES

The Technoklutz Puts dBASE in the Cellar

This lamb chop *c'est merveilleux*," the Technoklutz complimented his wife at a recent dinner party. "For perfection," he noted, "it needs only a bottle of *Chambolle-Musigny, 1961*, which fortuitously is in our cellar. I'll be right back," he promised. But he wasn't.

"He got involved with that computer again," his wife apologized during dessert. "No so!" shouted the Technoklutz, hurtling up the staircase at last, holding a dusty bottle like an Olympic torch. "I just couldn't put my hands on it right away. I have dozens of bottles, you know."

"Maybe you *should* have been at the computer," I suggested as I donned my Burberry. "It might help you to organize that stuff."

"Organize wine with a computer?" he laughed as he went to return the bottle.

The Technoklutz's office isn't far from mine, and when we bumped into each other the next day, he immediately asked, "How would I do it?"

"All you need," I said, "is a database management system; dBASE II is a popular one."

"*Debase*?" he cried. "To lower in character, quality, or value, to cheapen—that's not what I want to do with my wine!"

Nonetheless, he bought the program later in the day and called me that very night. "The damn thing doesn't speak English," he groused. "Its name starts with a lowercase

letter—that's incorrect! Then when you run it, it keeps saying 'DO CANCELLED'—*what* do I do and how can I do it if it's cancelled? And it doesn't require proper instructions from the user. If I want to change the way I'm setting up my file, for instance, I'm supposed to say 'MODI STRU' instead of 'modify structure' because it doesn't register anything beyond four letters. Even my children have a longer attention span."

"I thought you might like it," I said, "since you've always kept your wine in debasement."

"Not funny," he snarled. "And I have half a mind not to invite you to Sunday dinner."

When I arrived, the Technoklutz was in an expansive mood. I noticed that he had set Harold—his computer—on the sideboard. Next to it were seven or eight of the Prentice-Hall dBASE books. "I thought you'd given up," I said.

"Not at all," he crowed. "After I talked to you, I glanced through some documentation, and things started falling into place."

"Like?"

"I'll show you. But we ought to start the evening with a self-respecting but unostentatious aperitif—perhaps a *Domecq 'La Ina'*." He turned to the computer, hit a few keys, the disk drives whirred. "Ah," said the Technoklutz. "Shelf two, bottle fourteen." He was back within seconds.

"The program," he explained while we sipped, "asks what you want to keep track of—*fields*, they're called. I set my records up with eight fields: the name of the wine, the vintage, the type, the number of bottles on hand, the size (fifth, magnum, or jeroboam), price, my reaction after each tasting, and, of course, where I've stashed it. I can say, for example, LIST NAME+LOCATION FOR TYPE='BORDEAUX, WHITE' .AND. VINTAGE>'78' .AND. VINTAGE<'83'. That tells me exactly where the pick of my pale, shy Bordeaux are hiding. Then there are a few tricks for the advanced programmer. I can compare the cost of a case of *Chateau Montrose '66* to a few bottles of that year's *Pétrus*; see where my collection is strong or wanting; or, if I'm so inclined (not tonight, of course, dear boy), match the price of what I'm serving to the distinction of my guest. And I've added notes to a few entries, like 'Opened 1 bottle from this case—Christmas, '84... still a bit flinty and adolescent...try again in '88.'"

"Clever," I conceded.

"Computers," said the Technoklutz, "can do only what human ingenuity dictates. But now here's the fish, and time for what I hope will be an intelligent but not insistent *Chablis, Grand Cru, '81*." Again the disk drives whirred and again the Technoklutz took off for the cellar with purpose in his stride.

There was next a meat course with, predictably, a return to the computer and another appropriate wine; then, with dessert, back went the Technoklutz to dBASE II and down to the basement for, I believe, a "friendly if not obsequious *Chateau Rieussec, '76*." When dinner was over, he motioned for silence.

"I don't know why I thought computers would be hard," he announced. "Let's round out the evening with a celebratory *Sandeman, Vintage '66*. which is—" he had to restart the computer several times on this one—"shelf 4, bottle 31. I'll mosey on down and soon we'll be, as the sailors say, at sea in port."

This time it took a while for the Technoklutz to return from the basement. "No problem," he insisted, "I was just composing my toast."

"Say it," I urged, in the mood myself. And he did:

"dBASE II,
I love you,
Let's MODI STRU."

"Last week," I recalled, "you made a big to-do over its shortcomings."

"dBASE to-do cancelled," said the Technoklutz. And he took a mighty swig from the bottle.

—Stephen Banker

Stephen Banker's "Technoklutz" commentaries can be seen on the Public Television series *The New Tech Times*.

On-line School Boards Keep Kids in Touch

School boards—computer bulletin boards, that is—are becoming a viable part of the educational system. More and more, students and teachers around the country are going on line to exchange ideas and information.

One of the most ambitious school-sponsored projects is the bulletin board run by the Brooklyn Math and Science Research Academy. The network includes a host Apple IIe at Edward R. Murrow High School and Apples at 19 other participating schools. Brainwave—the Brooklyn Research Academy Information Network, (212) 258-7078—includes a message section where students can trade tips on research projects or read news about such things as scholarship application deadlines. There's also a file that lists volunteer mentors from area colleges and universities.

"We also use it for math and science competitions," says Marc Licht, assistant director of the academy. "In the morning, we'll put math or science questions on the board. Students at each school will log on, get the questions, and try to answer them. Then teachers will file the scores and we'll post the winners the next day."

The board also serves as an unofficial collection center for school news and social events. "It's almost like a school newspaper," says Licht.

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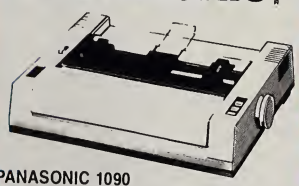

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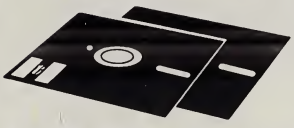

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Inquiry 1

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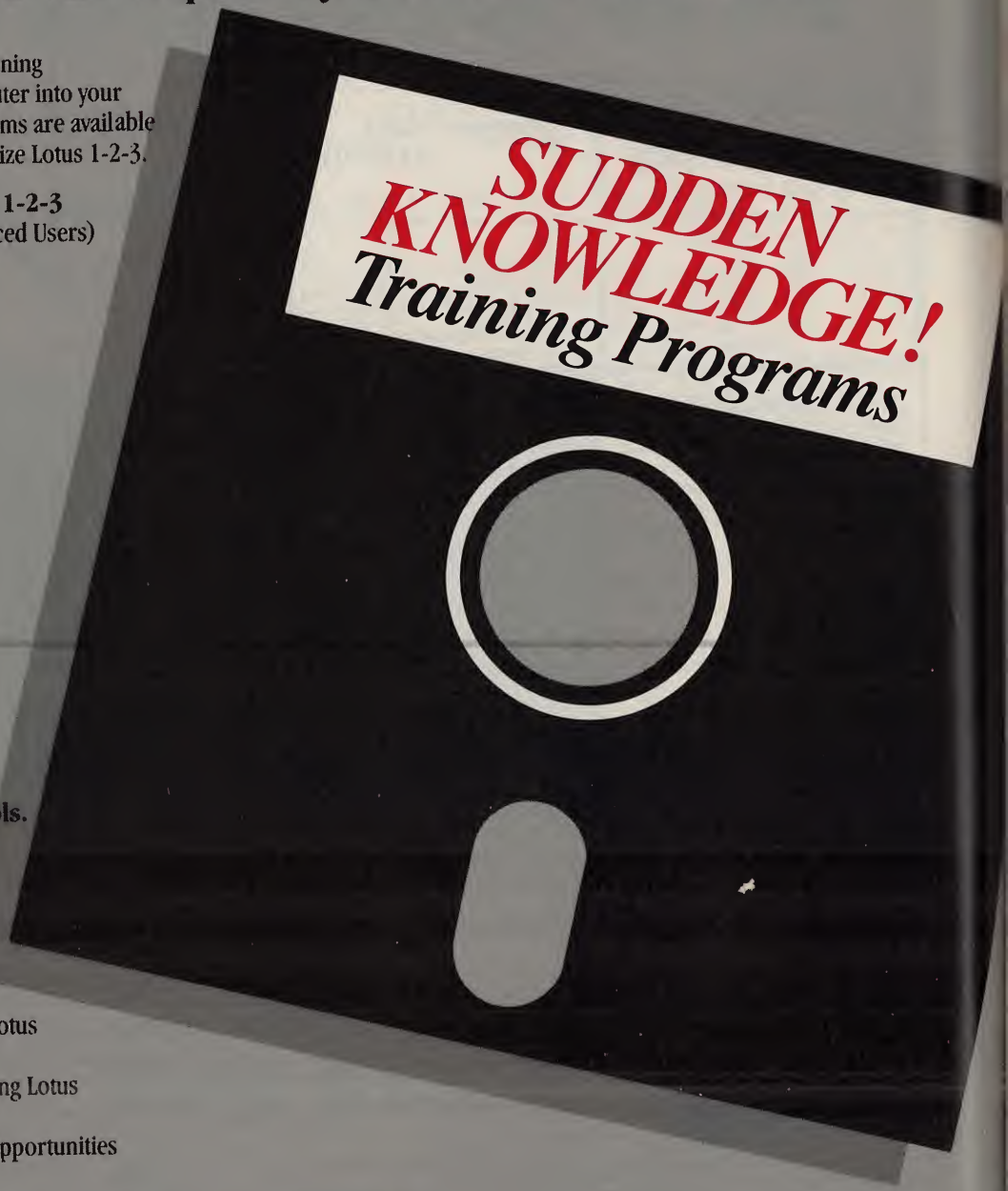

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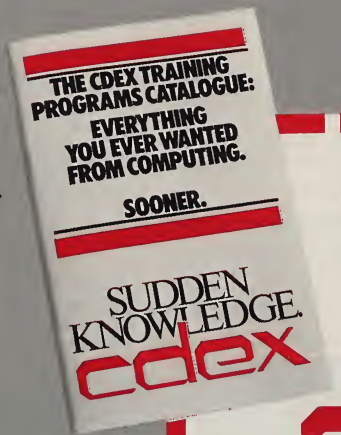
Inquiry 11



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The program has expanded from 15 schools last year to 20 this year. All the schools are in Brooklyn now, but officials are thinking about expanding the network throughout New York City.

Other Boards Abound

The Brooklyn project is certainly one of the most impressive school-based bulletin boards. But other such boards abound, providing fun and learning for students and teachers at all educational levels. At Michigan Technological University in the Upper Peninsula, sysop Timothy Collins says students use the BBS, (906) 487-2589, to keep in touch with family, friends, and other students. "A lot of our students have friends back in Detroit, and they use the board to exchange electronic mail," Collins says. Rhode Island College, in Providence, has an Atari board operating out of the school's Student Activities Center, (401) 456-8250, and students at Notre Dame University in South Bend, Indiana, keep up to date by dialing the Leprechaun, (219) 239-5875, run by Professor Barry Keating.

Ed Tech, at San Diego State University, (619) 265-3428, is "an electronic meeting ground for those who use new technologies in education," according to the sysop. A system in San Francisco, cosponsored by Computer Using Educators and the Far West Regional Educational Laboratory, (415) 565-3037, contains general information on computers in education, with a file of conferences and a discussion section devoted to educational issues. Education-80 in Greenwich, Connecticut, (203) 629-4375, is operated by the Mead School for Human Development, and the Fordham Jesuit BBS in New York City, (212) 579-2869, has a popular section that's reserved for educational topics.

Learning Plus Fun

But it's the high school students who seem to be having the most fun with bulletin boards. At Cheyenne Wells High School in eastern Colorado's farm country, the bulletin board is a "window on the world. We're very isolated in terms of exposure to what's going on outside," explains principal Bruce Sonnenfeld. That's one reason why he equipped one of the school's TRS-80 Model 4 computers to run a bulletin board. "I wanted to make the kids aware that there's more to computing than what we're doing in the classroom, and to show them there's more to the world than Cheyenne Wells." The remote BBS has attracted calls from computer professionals in New York, California, and almost everywhere in between. It's also been used as a place to display student essays and post news about school-related activity in the Colorado legislature.

None of that surprises Dave Hughes, an electronic author, poet, and social critic from Colorado Springs who gave Sonnenfeld the BBS idea. "The school has always been a kind of social center, especially in small towns," Hughes observes. When you add a computer bulletin board, "all of a sudden it becomes a community resource." Hughes reserves a section of his BBS, (303) 632-3391, for teachers, students, school-board members, and anyone else interested in education. He says the section, which he calls the "L'il Red Schoolhouse," has turned into an electronic schoolyard. "Kids are using it to find friends in other schools and to tell each other about classes and teachers."

And every once in a while, a serious policy discussion erupts. When school officials proposed bringing a breathalyzer to the senior prom, Hughes says the debate raged on for weeks, with students, parents, and school officials all joining in.

With topics such as these, the electronic open forum has become something special for a lot of kids in Colorado Springs, Hughes says. "It helps them deal with the challenges of growing up. How often does a kid get a chance to talk openly and frankly about what he really thinks?"

—Ric Manning

Ric Manning is editor of *Plumb*, a newsletter for modem users. He can reached via The Source (STQ007) or Compuserve (72715-210).

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Inquiry 85

Free Software

You might find it an attractive alternative to the pricey packages

You can't use a computer without software. And you probably won't be able to afford to do anything else *but* use your computer after you outfit yourself with a few programs, since it could easily take $1200 to $1500 just to get your machine to write, store data, and work with numbers. Public-domain software offers an attractive alternative to commercially available software. Variously referred to as freeware, shareware, and user-supported software, these programs are yours usually for the price of a floppy disk and postage. (For more information about free software, see page 82 in this issue.) In some cases, if you're satisfied with the program, you're asked to make a nominal donation, which entitles you to printed documentation, telephone support, updates, and the like. But just because software is free doesn't mean that it's a bargain. If a program does what you want done, then it's probably worthwhile. If it adds to the complexity of performing a task, then you're most likely better off without it—no matter what the price.

To complement our Special Report on inexpensive computing (page 69), we've reviewed three public-domain packages: PC-Write, a word processor from Quicksoft; File Express, a database management system from Expressware; and Freecalc, a spreadsheet from Stilwell Software Products. As you'll see from the individual reviews, free software, like commercially available software, has good and bad features and advantages and disadvantages. But once you decide what features you need, choosing the software is a cinch.

PC-WRITE

by Wayne J. Sassano

In the old days, word processing was called typing, and it frequently proved quite an ordeal. You'd hunt and peck furiously for an hour and roll out the finished product with a flourish. Unfortunately, typos, half-shifted letters, curious spacing, and erasure holes often sabotaged even your most brilliant ideas.

Today we've got microcomputers, word-processing software, and printers. They're sleek, fast, powerful—and expensive. An awful lot of scribes eat peanut butter sandwiches so they can feed their IBM PCs a suitable diet of high-quality word-processing software. Progress doesn't come cheap.

Or does it? For a mere $10 you can get PC-Write, a high-powered word processor from Quicksoft of Seattle, Washington. How powerful? Well, PC-Write has many of the features found in packages that cost a small fortune. For example, it lets you view and edit two different pieces of text simultaneously (from the same file or two different ones), its macro feature lets you record keystrokes and play them back at the touch of a button, and it has the ability to recall deletions, turn word wrap on or off, and search through text forward and backward. Unfortunately, PC-Write's cumbersome and arbitrary command sequences make the program somewhat difficult to learn.

PC-Write is one of those programs known as shareware, user-supported software. This means that if you know someone who has PC-Write, you can make a copy for free. What's the catch? Well, you do have to register your copy to receive company

support. For $75 you get a personal registration number, a printed copy of the manual, telephone and mail assistance for general questions, a disk containing all PC-Write's Pascal and assembly source files, and a copy of any program updates. As a registered owner, you also get a $25 commission from Quicksoft every time someone you gave a copy to becomes a registered PC-Write owner.

The manual is available separately for $25, but a condensed version, which you can view on-screen, is on the program disk. By entering Printman at the appropriate prompt, however, you can obtain a printout of the full manual. Quicksoft's low-budget approach to high-tech has resulted in a manual that is unlikely to win any awards for design and packaging—the title page was upside down—but it is replete with helpful information. Its tone is comfortable and soothing enough for the bewildered novice, yet sophisticated enough to maintain the more experienced user's interest. A rudimentary tutorial—"The physical box with the picture on it is called the 'display'; the picture itself is called the 'screen' "—is less helpful than the practice exercises at the end of each section.

I applaud Quicksoft's efforts to provide mnemonics for the program's functions and features whenever possible, but sometimes they seem a bit contrived. Text insertion, for example, comes in two modes, "Overwrite" and "Pushright." The latter is so named because it pushes text to the right (most other programs call this continuous insert). Because the PC's Scroll Lock key toggles the two modes, the manual advises you to think of "switching between a 'scrolling' insert (Pushright mode, lines scrolling right) and a 'locked' insert (Overwrite mode, lines locked in place)."

The manual also refers to the cursor's thickness as an indication of which mode is active: "in Pushright mode, the cursor is thicker than in Overwrite mode. Think of the thick cursor as pushing text forward and the thin one as sliding through text." I'd suggest you forget all this and simply check the status line at the top of the screen, where it says "Push" or "Over," depending on the mode that is active. You'll catch on in no time.

The status line, as is typical with most programs, remains on-screen at all times and keeps you apprised of what's going on. Here's what a status line looks like with a sample file called "letter": F1 Help. PushJustOff. 83% Free. 23% Thru. Edit "letter." As is obvious, the first item reminds you how to call the help screens. "PushJustOff" indicates what text insertion and formatting mode you're in. In this case "Push" indicates that when you enter new text, existing text is pushed aside, and "JustOff" is a reminder that the right margin will be unjustified (ragged). Other formatting possibilities are "Justify," which adds spaces between words to align the right margin, and "Un-Just," which undoes justification and removes the extra spaces. "83% Free" means you've used 17 percent of the editor's available memory, and "23% Thru" indicates the percentage of your text that precedes the cursor. "Edit 'letter' " reminds you that what is on the screen is an edited or changed version of what's stored on the disk. If you leave the editor under these circumstances, the file will automatically be saved in its revised form. If you haven't made any changes to a file, the status line says "Read 'letter' " and the file will not be rewritten when you leave the editor.

Wayne J. Sassano is a Connecticut-based communications consultant.

At a Glance

Name: PC-Write, Version 2.0

Type
Word processor

Manufacturer
Quicksoft
219 First N. #106
Seattle, WA 98109
(206) 282-0452

Price
$10 (nonregistered); $75 (registered)

Format
5¼-inch floppy disk

Computer
IBM PC, PCjr, and compatibles; works with most printers

Documentation
106-page manual (condensed version on disk for on-screen viewing; full manual can be printed out. Bound copy available separately for $25; included with registration fee)

Audience
Cost-conscious writers

Getting Started

PC-Write's help screens serve as a good introduction to the program. The first help screen gives a quick summary of PC-Write's basic commands. The others describe cursor movement; simple editing; marking blocks of text; search and replace; saving and switching files; setting the editor's ruler for margins, tabs, and (split-screen) text windows; on-screen formatting of paragraphs; and printer fonts and commands.

Pressing the F1 key while in the editor will deliver you to one of the nine help screens. (Be advised, however, that if you have just 64K bytes of memory, you'll be able to access only the first help screen, and you'll be able to edit only about three to nine double-spaced pages of text at a time.) The F1 key also returns you to the editor and thus serves as a toggle to the last help screen you've chosen. Switching between the editor and the help screens is fast and I found it helpful to be able to return quickly to an on-screen listing of commands instead of paging through the manual.

Cursor movement commands are fairly straightforward. The arrow keys move you one space at a time in any of four directions; using the Control key in conjunction with the arrow keys moves the cursor left or right one word at a time and up or down by paragraph. Using the arrow keys with the shift key moves the cursor to the left or right edge of the screen and up or down one screen at a time.

Deletions, whether by letter, word, or line, are simple. I liked the way PC-Write lets you delete text in

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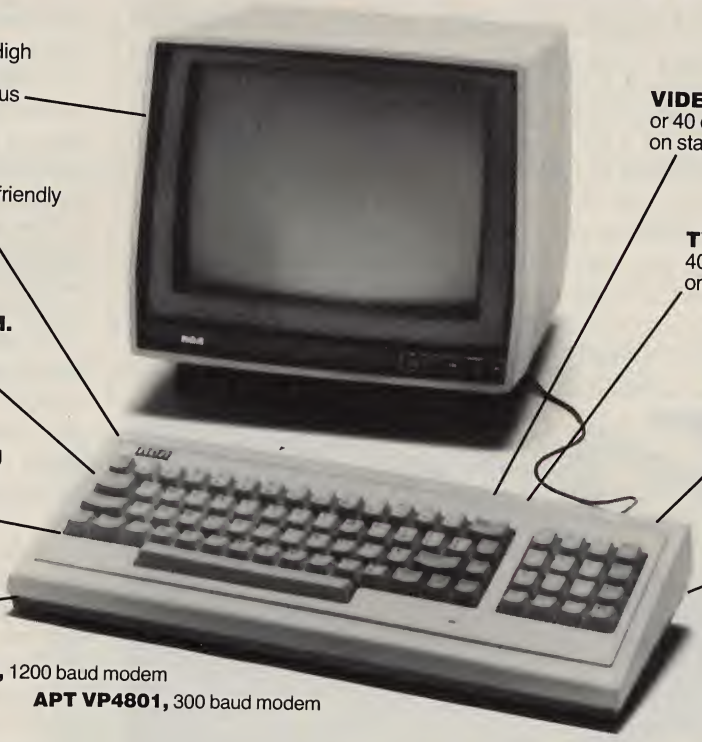

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Data Communications Products

Inquiry 63

either direction from the cursor's current position. To delete backward, press Bksp for characters, Ctrl Bksp for words; to delete forward, it's Del for characters, Ctrl Esc for words. Ctrl plus Enter deletes from the cursor to the end of the line. Should you (gasp!) delete a word or line accidentally, you can recover it by pressing the Ctrl and F4 keys.

As with most word-processing programs, PC-Write lets you mark blocks of text that you can then move, copy, or delete. Marked copy goes to a hold area (copy buffer) where it can be inserted into, or used to replace, a different file. Surprisingly, only one piece of text can be marked at a time. I consider this a drawback. If different pieces of text could be marked and then stacked consecutively in the copy buffer, you could easily rearrange an entire document and then recall it with a keystroke or two.

PC-Write lets you search forward or backward, one occurrence at a time or globally. You can match entire blocks of text; "unreplace" a previous replacement; and invoke six different wild-card search-and-replace functions to match currently marked text, any text in the copy buffer, any letter or digit, any character except a letter or digit, any one character, or any line boundary (an invisible character inserted by the word-wrap function). To perform a single search and replace, you first depress the F9 key, enter the search text, press F10, enter the replacement text, hit Enter, then Alt F10, and finally the F1 key. That is a fairly complicated sequence to remember, but maybe I've just been spoiled by "friendlier" word processors. The package I'm using right now, for example, searches with Ctrl S and replaces with Ctrl R.

If you have 196K bytes of memory, you can exit from the PC-Write editor and return to DOS or run other programs while PC-Write and your text files are still in memory. Another feature I like is the automatic backup. When you first retrieve a file from the disk, the PC-Write editor reads it and gives you the option to make a backup copy. This ensures against a file being lost through disk or user error. Some people might describe this feature as overkill, but if you've ever inadvertently wiped out a valuable piece of text, you'll really appreciate having the extra copy. It does mean your disk will fill up rather quickly, however, so you'll have to delete all those backups—and backed-up backups—every now and then.

To format your text on-screen, you must use what Quicksoft refers to as a Ruler Line. This is actually a separate file containing various formatting parameters, such as line length, margin widths, paragraph indents, and tab stops. You must create a Ruler file for each document; if your file's name is "sample," its Ruler file would be "RULER.sample." Whenever you edit a file, the program

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The Club Mac News, July 1984

"...for virtually the first time in human history (pardon our gushing), there's a simple way to index ideas via visual images..."

The Club Mac News, August 1984

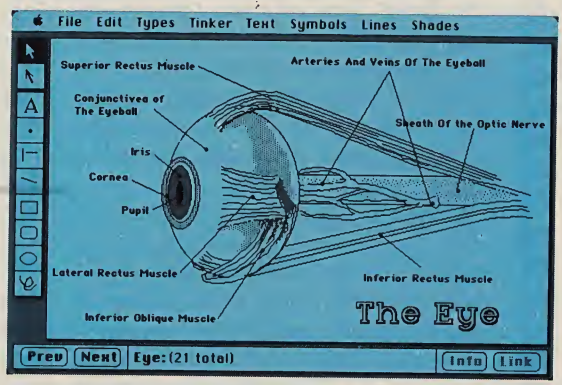
"Filevision is one of the most impressive uses of the Mac so far ...it shows off the hardware to the hilt."

"...it perfectly embodies the spirit of the Mac in making information accessible and comprehensible for the rest of us."

Esther Dyson
RELease 1.0

"Almost as importantly, it sets a standard for other developers, and consumers will come to not accept anything less."

Guy Kawasaki
"Software Evangelist"
Apple Computer, Inc.



Here's what they saw when they looked into technical drawings. Data forms connected to each object in the picture.

"It is Filevision's unique integration of object-oriented drawing and data base functions that give it the edge over other stand-alone graphics or data base applications."

MacLine, September 1984

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Inquiry 74

checks to see if there is a Ruler file to go with it; if not, the program uses the default settings contained in the file "RULER.def." This formatting setup requires too much extra work. I would prefer being able to set margins, tabs, line lengths and such directly in the text file through the use of a format line that remains on-screen. With PC-Write, however, you see the Ruler Line only when you press the F2 key.

If you're still attached to your old typewriter, PC-Write understands: the Ruler Line lets you release the right margin by pressing the Shift and End keys simultaneously—this turns off word wrap until you press Enter—and you can even set a bell to ring (beep) when you reach the right margin. Quaint.

Other features that deserve to be mentioned include unlimited horizontal screen scrolling (for *really* wide documents) and the ability to place headers and footers left, right, or center. Letters and words can be transposed and switched from upper- to lowercase and vice versa; lines can be centered; you can insert hard spaces and soft hyphens; force page breaks; record keystrokes with the sequence Ctrl F1, text, Ctrl F1, and play them back by pressing the asterisk (*) key.

Only a few keystrokes are required to perform the other operations, but the command sequences aren't particularly easy to remember. Other programs I have tested let you set tabs, for example, with Ctrl T, force an end of page with Ctrl E, toggle boldface with Ctrl B, and center lines with Ctrl C. But unless you rely heavily on PC-Write's help screens, it can be a struggle to dredge up the commands for centering (Shift F8), changing case (F8), and recalling text sent to the copy buffer (Ctrl F4). The latter is important, for if you exit the editor with text still in the buffer, it's gone forever. According to Quicksoft, an updated version of PC-Write (2.3) will include conditional page breaks and the ability to reformat an entire document. Version 2.0 permits reformatting only a paragraph at a time.

Printing

To obtain a hard copy of your text, you have to use PC-Write's page printer. Like the Ruler Line, this is a separate file. The special fonts and other features available will depend on the printer you are using, but most models should support the basics such as multiple-line spacing, double-wide characters, boldface, and underlining. PC-Write has a feature that allows you to generate form letters without buying a database program. Say, for example, that you wish to send the same letter to 10 people. While in the editor, all you do is add user prompts (.U:) where the name and address lines are to appear, and the page printer will prompt you for the appropriate information to be inserted into each letter.

It should be clear by now that PC-Write has much of the power and many of the features generally found only in expensive word-processing packages. Perhaps its greatest strength is that it makes full use of the IBM PC's keyboard and display capabilities. But that is also its greatest weakness, for by relying heavily on the PC's 10 function keys, used alone and in combination with Ctrl, Shift, or Alt, PC-Write can be difficult to learn. The association between a function key and its assigned function just isn't clear enough to make PC-Write easy to use. Sure, the help screens help, but I'll bet even an experienced user would hesitate before coming up with the differences between, say, F5 and Ctrl F7. A keyboard template or overlay would be a great help.

Nevertheless, while the numerous commands take some getting used to, and some are just plain cumbersome, there is no question that PC-Write is worth far more than its incredibly low price. If you own an IBM PC, PCjr, or compatible, this is one sweet deal. Just make sure you get Version 2.3, for several bugs have been removed and some new features have been added. The new version will also contain two double-sided program disks (both originals) instead of one single-sided floppy. □

FILE EXPRESS

by Aaron S. Liswood

Managing information is the essence of what computers are all about. Storing, sorting, and retrieving data are part of the natural behavior of microprocessors. Database management programs are your link to these split-second electronic functions.

As with other types of software, database managers come in all shapes and colors, each making a different-sized dent in your purse. One program that makes nary a dent at all is File Express, a file management program for the IBM PC and compatibles that is free on request. If you find the program useful, you're invited to remit $40, which buys you updates and bound documentation. File Express is not copy-protected, and you're encouraged to share the program.

As with most user-supported software, the documentation comes on the disk and you must print it yourself. If you set your margins according to the instructions, you'll end up with an 84-page manual. The file for printing the documentation is broken into three parts, to make it more convenient to print than if it were one long file. If you send in $40, you will receive a 144-page spiral-bound manual, which differs only slightly from the on-disk version.

File Express's documentation is clear and covers all the essentials. Although there's no index, you should be able to find what you're looking for by skimming through the lengthy table of contents.

File Express's menu structure makes the program easy to use. The menu items are, in the main, self-explanatory. And for most operations, you just follow prompts. I found that I had to refer to the manual only to check on certain specifics. Generally, there is no on-line help feature. The one exception is that while you're in the process of defining a record, pressing the question mark key will give you a list of the data types.

Aaron S. Liswood is a senior consultant specializing in compensation systems with A. S. Hansen Inc., San Francisco.

Overview

Database management software falls into two main categories: file management programs and database management programs. Many features distinguish these two types of software but, generally, file managers are less powerful and flexible than true database managers. More specifically, and more significantly, perhaps, is the fact that file managers can work with only one file at a time, while database managers let you keep multiple files open at the same time. Both types of programs, however, organize data in much the same fashion, first in files, then records, then fields. Files contain information about a broad category, such as all the inventory in a warehouse. Each item in the inventory is represented by a record, which in turn contains fields of specific information about that item, such as quantity, price, and order number.

File Express is a file manager that's a step ahead of other programs of its type; a few extra features give you a good bit of control over organizing and retrieving data. Calculated fields, a fairly sophisticated report generator, a file merge feature, and great flexibility in searching and updating records make this program much more useful than many other file managers.

File Express comes with a sample database that includes 10 records in a mailing-list format, a sample report, and a label format. The sample will give you an idea of what the program can do.

Creating a Database

File Express runs from a main menu. When you first boot the program, you're presented with nine op-

tions: select/change files; add data to file; search and update; sort index; print reports; print mailing label; file maintenance; clone new database; and end session, change disk drives, and set function keys. When you boot the program, only the first and last two options are active. Pressing the Escape key will always walk you back to the main menu.

A replicate command will automatically enter the same information in designated fields in multiple records.

The first order of business is either to create a new database or to select any previously created files. You follow prompts to define the fields, indicating size and type. Each record can contain up to 40 fields to a maximum of 2400 characters per record. A database can contain 32,767 records.

Data type options are numeric, character, and calculated. The field name can be 12 characters long. Numeric field values may be up to 14 characters long; character field values may be up to 60 characters long. Calculated fields let you set up fields whose values are the results of calculations performed with values from other fields. For example, if you had a field that contained the price of an item and another field that contained the number of items in stock, you could multiply the two values to obtain a total value for all the items on hand. It would be shown in a third, calculated field.

Automatic date and time fields fill in the current date and time in any field you indicate. You can display time, day as a number, day as an abbreviation, month written out full or abbreviated, year, year-month-day, or day-month-year in genealogy style (14 February 1985).

The fields are listed vertically onscreen; you can't format your records on the monitor. File Express assigns numbers to each field and tracks the fields by number rather than by name, which means that you could have more than one field with the same name. You could, for example, call several fields "Comments," thus getting around the 60-character limitation on a field value. This would be a great convenience if your data is mostly text.

One particularly helpful feature of File Express is the option to change your field organization after you have completed the definition process. You can add another field after you have created records and worked with the file for a while. Many top-of-the-line programs don't let you alter the structure of the database once you've started to enter information. The PgUp and PgDn keys let you move back and forth between records for data entry and for editing.

Data Entry

Filling in the fields is a fairly straightforward affair. You simply select the second option, "add data to file," from the main menu. The first field will be highlighted, and you type in what you want. The Return key moves you from field to field, and you continue typing until you've filled in all the fields in the record. A replicate command will automatically enter the same information in designated fields in multiple records. This feature, not found in every file manager, can save you a lot of typing.

Correcting mistakes is a matter of moving the cursor to the field you want to change and fixing the error. Calculations, in calculated fields, are executed as you pass over that field with the cursor. You save your work by calling up the Save submenu or by pressing the Return key twice after you've filled in the last field in the record.

File Express lets you create new databases from existing ones, transfer records from a current file, and change, add, or delete fields from any record. You can also merge up to 10 different files into one large file, up to the maximum database size of 32,767 records.

Searching and Sorting

The search and update functions are very flexible and work quickly and elegantly. You can search for a record by record number, by field contents in any field in its entirety or by any string of imbedded text within a field, or go to the last record in the file. You can also search for a field that ends in a certain value. You could search for anything that ends in "1985," for example. As you edit and change fields, calculated fields are automatically recalculated.

The global search-and-replace feature will automatically search for a specific field and update information according to your criteria, or it will find each occurrence of fields that meet your search criteria and wait for your confirmation before making the change. A global search-and-delete works the same way. You can order a printout of all the records that were changed or deleted.

All the fields are key fields, which means that you can search for information in any one of them. You can use up to 10 "ANDs" and "ORs" and any combination of "equals," "is not equal to," "is less than," and "is greater than" in specifying your search criteria.

You can search for duplicate fields in a file and eliminate double entries of the same record. You can also search in two separate databases for duplicate information. Again, you can request printouts of the duplicates.

Sorting is just as straightforward. You can sort on up to 10 fields in ascending or descending order, alphabetically or numerically. You can use the entire field or only part of a field value in your sort, which does not physically move the data but rather creates an index that's used by the program for functions such as data editing and printing.

Printing

File Express, unlike many other file managers, can produce reports that contain more than the standard columnar listing of data. File Express allows you to put data from a record anywhere you wish on a page of a printout. For example, you can use

"MANAGING YOUR MONEY™ is, simply, the finest personal financial management program on the market."

PERSONAL SOFTWARE MAGAZINE, JULY, 1984.

"The first fully-integrated financial program that really makes a computer for the home worth the money."

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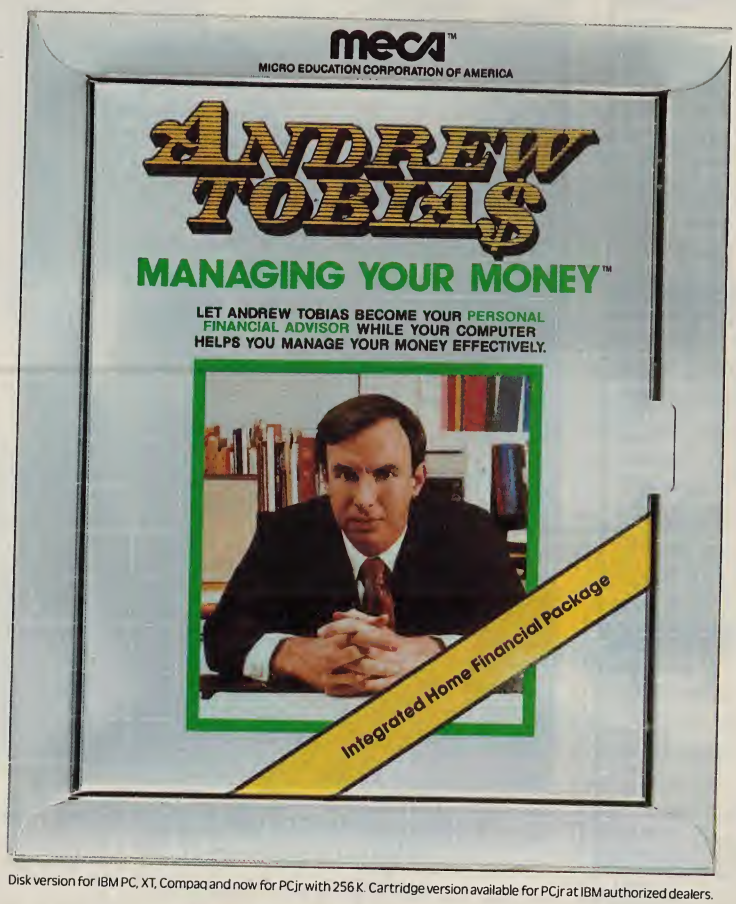
KEN USTON'S ILLUSTRATED GUIDE TO THE IBM PC.



Disk version for IBM PC, XT, Compaq and now for PCjr with 256 K. Cartridge version available for PCjr at IBM authorized dealers.

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FORBES,
APRIL 9, 1984.

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MAY, 1984.

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File Express to create customized reports with labels, headings, totals, calculations, signature blocks, and mailing labels placed anywhere on the page. You can, of course, select the records you wish to appear in your reports.

Mailing labels are printed one, two, or three across on a page. And File Express automatically removes blank lines from labels if a field doesn't exist in a particular record.

File Express's advanced report generator is in contrast to its rather simple method of entering data in columns on-screen. Many other programs let you design an on-screen format as well as a report format. But, in the end, professional-looking reports are more desirable than fancy data-entry screens.

File Maintenance

The file-maintenance option from the main menu lets you take care of basic housekeeping such as changing field names, data types, and calculation formulas. You can make mail-merge files to use with your word processor, selecting only those fields you wish to be in a file. An important feature allows you to take sequential, mail-merge, and other fixed-length files and add them to your database.

The Bottom Line

All in all, File Express is a high-end file management system. Although, as with other programs of its type, File Express works with only one file at a time, its calculated fields, flexible searching option, and report generator make this a very attractive program. I'd consider File Express a good deal even at two or three times its price. At $40, it would be hard to beat. □

At a Glance

Name: File Express

Type
User-supported file management program

Manufacturer
Expressware
POB 6275
Rancho Palos Verdes, CA 90734
(213) 514-3737

Price
$40 donation requested

Format
5¼-inch floppy disk

Computers
IBM PC and selected compatibles; requires 128K bytes of memory and one disk drive (two are recommended)

Documentation
Substantial documentation included on utilities disk; 144-page loose-leaf manual available from manufacturer

Audience
Anyone in need of a file management system

FREECALC

by George F. Goley IV

The electronic spreadsheet is a true friend of anyone who needs to manipulate numbers quickly and frequently. But high prices can put these programs out of reach of many potential spreadsheet users. Freecalc, a spreadsheet program for the IBM PC, is well within anyone's budget because it's essentially free.

It's tempting to suggest that because this program is free it must be worthwhile. After all, what can you lose? But software is only as good as the task it performs. Unfortunately, due to size and power limitations, it's a bargain for only a select few.

The basic function of an electronic spreadsheet is to automatically recalculate equations using different variables. Freecalc does provide this basic function but not much else. For this reason, this spreadsheet may be useful for the simplest of home applications but unsuitable for business applications because of limitations in size, speed, and formatting capabilities; its lack of graphics and statistical functions; and its inability to replicate, insert, or delete sections.

George F. Goley IV is manager of management information systems at Prime Resources Group Ltd. in Philadelphia. He is also president of Micro Endeavors Inc., a New Jersey-based microcomputer consulting and programming firm.

Freecalc is available for the price of a floppy disk and postage. Stilwell Software Products does ask you to send a contribution of $35 if you find the program useful. You're allowed to copy the program and share copies with others, but you're not allowed to sell the program.

The biggest problem with Freecalc, though, is its system requirements. Freecalc runs on an IBM PC with at least 128K bytes of random-access memory (RAM) with PC-DOS 1.1 and 192K bytes of RAM with PC-DOS 2.0 and one disk drive. Such a system typically sells for between $2000 and $2500. People making capital outlays of this size usually need sophisticated productivity tools, not marginally useful programs. In short, Freecalc's system requirements remove it from its logical marketplace, the home market.

Freecalc would be ideal for people who already own IBM PCs and want to introduce themselves to the wonders of using an electronic spreadsheet without paying for a lot of business-oriented features such as graphics, the ability to write customized programs, and extensive financial functions. Accordingly, Freecalc would be good for managing a household budget. With this application, you would list your expenses against your income and then explore what-if conditions. You could analyze, for example, the effect of a raise on your spending power or the effect of a new car loan on your entertainment budget.

Perhaps best of all, you won't have to attend a seminar to learn how to run the program. If you've used an electronic spreadsheet before, you can be using Freecalc in about 10 minutes. If you've never seen a spreadsheet, it may take you 15 minutes to get started. Logical and straightforward commands are responsible for its user-friendliness. When working with Freecalc, you can either type in your command or use the arrow keys on the PC to point to your selection.

After you follow the simple instructions to set up a working Free-

calc disk and type FC to enter the program, you'll be at the main menu. Options available to you at that point include Attributes, which allows you to select the number of decimal places to be displayed; Blank, which allows you to blank a single cell; Enter, which allows you to enter data (10 characters per cell and 7 digits for numeric entry) and labels (right, left, or centered); Formula, which lets you enter a formula you've created or one of the System Utilities: Sum, Minus, Average, Greatest Value, Least Value, and Count; and Goto, which lets you move quickly to any cell in the spreadsheet.

The main menu also includes Help, which tells you how to move the cursor and select menu options; Load, which lets you load a file from the disk or obtain a directory of Freecalc files on the disk; New, which clears the current spreadsheet; Print, which prints a rectangle of cells that you select; Quit, which lets you leave the program and return to the operating system; Recalc, which lets you choose between having the entire spreadsheet recalculated automatically after every entry of data or having the spreadsheet recalculated only on your command; and Save, which stores the current spreadsheet on disk. To select an option you can either type the first letter of any command or use the F9 and F10 keys to position the cursor over your choice and then press the Return key.

Freecalc can support only a 100-row by 25-column spreadsheet. This is fairly small, but big enough for general home applications.

Let's run through a typical application. To set up an income statement spreadsheet, for example, you simply choose Enter from the main menu and type in your labels for expenses, such as Mortgage, Car Payment, Utilities, and Credit Cards. Next to these entries, you would type in value amounts and choose a place on the spreadsheet to add this column of numbers. Totaling the numbers is slightly more involved than entering them. You need to select the Formula option from the main menu and then choose the System option to reach a list of predesigned formulas. From this list, you choose the Sum option. Finally, you use the cursor to point to the first and last numbers to be added. Having completed this sequence, you can display the total of your expenses wherever you choose on the spreadsheet. After making similar entries for income, you would then write a formula to subtract total expenses from total income.

Freecalc would be ideal for people who own IBM PCs and want to introduce themselves to the wonders of using a spreadsheet without paying for the extras.

Now you're ready to take advantage of the ability of the spreadsheet to recalculate totals based on a variety of values. You just substitute dollar amounts in either expenses or income and Freecalc will show you how those changes affect your total financial picture.

Other possible uses include simple calculations such as Little League team statistics, bowling team averages, or bridge party scoring. These calculations take on a new importance when printed by a computer and often generate a little extra enthusiasm. Further, it is much easier to update team stats with a spreadsheet after every game than it is to sit down with pencil and eraser every couple of weeks. After all, the spreadsheet not only handles all of the math for you but also does the printing.

Problems

Freecalc does not let you insert new rows or columns into an existing spreadsheet model. Since the main use of any spreadsheet program is to modify conditions and examine the resulting changes, this is a major limitation indeed. If you design a simple spreadsheet to budget your monthly expenses and later discover a new expense that you'd like to incorporate into your spreadsheet, Freecalc requires that you redesign large portions of the spreadsheet to accommodate the new category. I know of no other spreadsheet program that does not let you insert new rows and columns in an existing model.

Freecalc uses an unconventional labeling scheme for designating cell locations. Rather than the customary alphabetic column headings and numeric row labels, Freecalc uses numeric designators for both rows and columns. This awkward design may confuse both new users who may move on to spreadsheets that conform to the letter/number naming scheme and veterans who are accustomed to that scheme.

The program is very slow in its recalculations. For example, a 75-cell spreadsheet that Lotus 1-2-3 can recalculate almost immediately takes approximately 16 seconds to recalculate using Freecalc. (1-2-3, of course, costs $495.)

Since the only formatting options available are the number of decimal places, Freecalc makes it difficult for you to create presentable, readable printouts. Further, the limitation of 10 characters per cell is annoying, and the limitation of 7 digits for numeric entries could be crippling in some applications.

Freecalc has no replicate command, which means that you can't duplicate your formulas and data to make spreadsheet creation easier. If, for example, you set up a spreadsheet for projected expenses and income for the next month and decide to stretch your forecast into two months, you will have to retype all of your formulas and data. If you need three months, you'll have to retype them again. Most spreadsheet programs let you issue a command to copy the first month's data and formulas as many times as neces-

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sary, with no retyping.

Freecalc's documentation is stored in a text file on the floppy disk. You must print the file to obtain a hard copy. This documentation is 36 typewritten, single-spaced pages and includes a table of contents, introduction to electronic spreadsheet concepts and Freecalc, explanations of the three demonstration files, and explanations of each of the main menu options. Although the instructions are easy to follow, the text is wordy.

Freecalc, then, is affordable and easy to use. But its small size and limited number of features exclude it from any serious business application. Its only practical use is as a personal balance sheet or for keeping track of simple sets of numbers or figures, such as Little League stats. And the only logical users are people who already own IBM PCs.

Software purchase decisions should be based on the nature of the task to be accomplished. If your spreadsheet needs fall within the rather narrow domain of jobs for which Freecalc is suited, then it may be every bit the bargain it seems. If, however, you want to do some serious number manipulating, Freecalc is likely to be a disappointment. □

At a Glance

Name: Freecalc

Type
Electronic spreadsheet

Manufacturer
Stilwell Software Products
16403 North 43rd Dr.
Glendale, AZ 85306
(602) 978-4678

Price
$35 donation requested

Format
5¼-inch floppy disk

Computer
IBM PC and compatibles

Documentation
36 single-spaced typewritten pages that you must print from a disk file

Audience
IBM PC (or compatible) owners with simple spreadsheet needs

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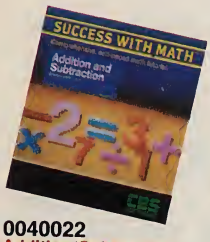
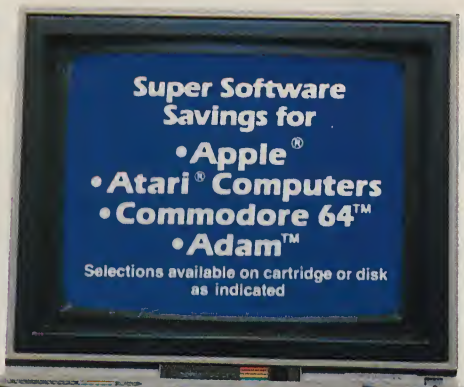
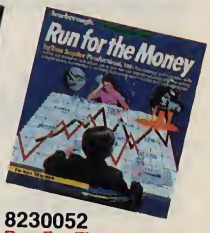


0040022
Addition/Subtraction
0041012
Multiplication/Division
Both available for C-64, Atari H.C. and Apple: *disk.*

8035022
Zaxxon
Adam, C-64: *cart;* Atari H.C.: *disk and cart;* Apple: *disk.*



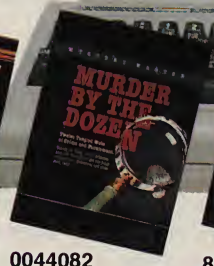
8172052
Master Type
C-64, Atari H.C.: *disk and cart;* Apple: *disk.*



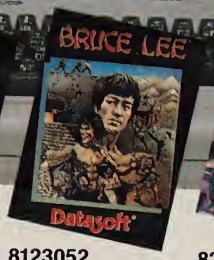
8230052
Run For The Money
C-64, Atari H.C. and Apple: *disk.*

8122062
Pitfall II
Adam, Atari H.C.: *cart;* C-64: *disk and cart.*

8100022
Choplifter
C-64, Atari H.C.: *disk and cart;* Apple: *disk.*



0044082
Murder By The Dozen
C-64, Apple: *disk.*



8123052
Bruce Lee
C-64, Atari H.C. and Apple: *disk.*

8216032
Seastalker
C-64, Atari H.C. and Apple: *disk.*

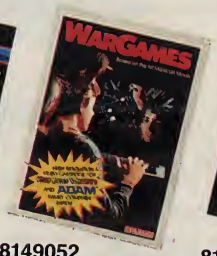
8101012
Lode Runner
C-64, Atari H.C.: *disk and cart;* Apple: *disk.*

8090042
River Raid
C-64: *disk and cart;* Atari H.C., Adam: *cart.*

8105072
Zork II
Atari H.C. and Apple: *disk.*

8104082
Zork I
Atari H.C. and Apple: *disk.*

8150012
Summer Games
C-64, Atari H.C. and Apple: *disk.*



8149052
WarGames
Adam: *cart.*

8102002
Temple of Apshai
C-64, Atari H.C. and Apple: *disk.*

8215042
Beach-Head
C-64, Atari H.C.: *disk.*

8103092
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C-64, Atari H.C.: *cart.*

8229082
Pitstop II
C-64, Atari H.C. and Apple: *disk.*

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Inquiry 15

BUSINESS

Appleworks

Integrating a word processor, database, and spreadsheet, this IIe and IIc program succeeds in a business setting

by Jonathan Sacks

Appleworks—Apple's integrated software for the Apple IIe and IIc—has become one of the hottest-selling software products in the country.

It's easy to see why.

The program is a marriage of perhaps the three most popular applications programs: a word processor, database, and spreadsheet. Each of the programs is good enough to stand alone. Together they create a powerful package that's easy to learn and pleasant to use. True to its genre, Appleworks goes beyond simply putting different applications on a single disk. And although it's not integrated to the degree that some of the more advanced packages are, Appleworks does provide a convenient way for the three programs to share data.

Appleworks should be of special interest to anyone who uses the Apple IIe or IIc for business, with one note of caution. The program is big—it takes up all of a 143K-byte disk—and a second disk drive is an absolute necessity unless you're willing to tolerate swapping disks all the time. Owners of the IIe must buy an 80-column card to run Appleworks, and they would be well advised to buy an additional 64K bytes of RAM (random-access memory) so as to be able to take full advantage of the program's maximum file sizes.

With those hardware requirements met, Appleworks becomes a useful business tool that can help you track inventories, produce reports and letters, and run what-if analyses. In performing those tasks, you can move or copy information from one application to another. For example, numbers from the spreadsheet can go into a report you've created with the word processor.

Addresses in the database can be copied into a letter. And because Appleworks allows you to work on one file while as many as 11 other files (up to a total of 55K bytes' worth of data) remain open in the background, the transfer of information can be lightning fast.

Appleworks, however, is not perfectly integrated: the functions of each application are independent of one another, and if you change a figure in the spreadsheet, it will not automatically be reflected in the database. Such a level of integration would have greatly enhanced the usefulness of the program.

The Integrator

The hub of the Appleworks system is the main menu, from which you create new files or retrieve those you have saved. You can return to the main menu from anywhere in the program by tapping the Escape key.

Each time you work with a document or file, Appleworks places it in an area in RAM called the desktop, which has been reserved by the Appleworks program as a pseudo-disk. When you work on a file, it stays in RAM until you save it on your floppy disk or until you turn off your computer.

To facilitate moving data from file to file, Appleworks reserves a 250-line buffer called the clipboard. When you want to transfer information from one file to another, you first define the block you want to move then send it to the clipboard. That data is stored in the clipboard until you're ready to use it—as long as you don't send any other data there. Appleworks automatically deletes what was previously on the clipboard when new information arrives.

The three parts of Appleworks share command structures as well as information, and this makes the program friendly to users. The important commands are the same in each application. Each application also has commands tailored to its individual functions. A help function for each application lists the commands and how to execute them.

Let's take a closer look at each of the applications to see just how versatile Appleworks is.

The Word Processor

Like other word-processing programs and like both of its companion programs, the word processor has two interrelated functions: editing (information entry and revision) and formatting (for printing).

Appleworks word-processing documents can be up to 2250 lines long regardless of the size of RAM. Practically speaking, however, with 64K bytes of RAM and assuming a 60- to 70-character line, your maximum document length is eight single-spaced pages. With 128K bytes of RAM, you can generate a document of up to 26 single-spaced pages. To create a document, you simply tell Appleworks you will be building a word-processing file via menu choices.

Appleworks presents you with a nearly blank screen. You share your writing workspace with a prompt line at the bottom of the screen, which tracks your location in the document and reminds you that the Open Apple and question mark keys will bring you help. To enter text you simply type it in. The Delete key erases letters behind the cursor. Sentences, paragraphs, and long blocks of text can be cut and pasted with a few keystrokes. You can overwrite text by toggling a couple of keys. The same keys put you in the insert mode so you can expand existing documents.

Appleworks' full range of editing functions helps you work more efficiently. You can, of course, move chunks of text around within a document using the search and replace function. And you can ask Appleworks to find a word or several

Jonathan Sacks is a West Coast editor of *Popular Computing*.

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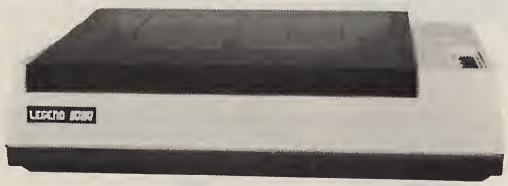

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Inquiry 9

words and replace those words if you wish. It will ask you whether you want to do that all at once or check each occurrence.

The Appleworks word processor lets you control the appearance of your text in a variety of ways. You can insert bullets, indicate hanging paragraphs, set footnotes, and show text as boldfaced or underlined by choosing a formatting menu and imbedding commands. Appleworks also lets you change printer options, so that you can reset paper width, margins, justification, and spacing of characters (if your printer permits). You see the final result on the printout—not on the screen.

One function that became my favorite in the Appleworks word processor allows you to stop the printer at a specific point in your document so that you can enter information at the keyboard and send it directly to the printer. This is especially useful when sending multiple letters with the same information because you can personalize without editing the document each time.

The Database

In addition to providing you with a tool to create your own filing system from scratch, the Appleworks database lets you reformat data from ASCII text files and from DIF (Data Interchange Format) files orginally created with other programs such as Visicalc.

Following the standard file organization, the Appleworks database stores information in records, which are analogous to index cards in a card file, and fields, which correspond to the individual bits of information, such as name, address, etc., you'd find on those cards. With 64K bytes of RAM, this database can handle about 140 records with 75 characters each. The number of fields depends on their length up to a maximum of 30 per record. With double the RAM, you can have about 750 records.

To create a file, you first define the fields. Field names can be up to 20 characters long, and the length of each field depends on the number of

fields you create. If you have 15 fields or fewer, you can enter up to 80 characters, including the field name. With this number of fields, the information in the record is arranged in a single column on-screen. If you have more than 15 fields, Appleworks creates a second column, significantly reducing the space for data.

You can copy groups of records from one database to another or from the database to the word processor. You can look at parts of several records at the same time arranged in a list on-screen, or you can examine individual records in their entirety. The multiple record layout is especially useful for viewing and comparing similar categories in several records.

You can also easily sort records to display whatever information you wish. I did that when I used the database to inventory my belongings. First, I created categories that included the item description, value, location, etc. Then, when my insurance agent needed a list of jewelry I owned that was valued at more than $200, I simply sorted on the description category (jewelry) and the value category (equal to or greater than $200).

Appleworks allows you to string selection criteria by choosing several categories and defining what you want to select. In each category, you can have up to 12 criteria, including the common arithmetic functions such as "equals," "is less than," "is greater than," and so forth, as well as functions like "ends with," "contains," and "does not contain."

In generating reports you can change the record layout, moving categories to fit your needs, and, at any time, you can change the structure of your file, adding new categories and deleting those you no longer need.

When you format the file, you can adjust column widths and justify text if appropriate.

The Spreadsheet

Two hallmarks of a good spreadsheet are simple entry of information and the ability to change information easily. Appleworks meets both of these requirements.

The potential size of the Appleworks spreadsheet depends upon your computer's RAM. Theoretically each spreadsheet can contain 127 columns and 999 rows. In reality, a 64K-byte computer can handle about 1000 cells (a cell being the point where a row and a column intersect). A 128K-byte computer can handle about 6000 cells.

The Appleworks spreadsheet uses the standard column and row layout. Each value can be up to seven decimal places long, and the six formats available are fixed, dollars, commas (automatically placed between thousands), percent, variable,

and standard (which causes the cell to default to what you've set for the entire spreadsheet). You can set columns up to 75 characters wide, and you can always insert, delete, or move rows or columns.

Any cell can be assigned a formula. Appleworks also permits you to enter more complex functions, like square root or average operations.

Using windows, Appleworks lets you take a look at two parts of the spreadsheet at the same time. When split, the spreadsheet windows move independently of one another, but changes made to one will ripple through the other.

If you want to generate a report from your spreadsheet, you can print the entire spreadsheet or just rows, columns, or a certain block. You can change margins and print headers, just as with other Appleworks applications.

As built-in user insurance, Appleworks won't let you accidentally overwrite an existing file. When you store a file, for example, Appleworks warns you if you already have a file with that name.

An Appleworks submenu allows you to perform all sorts of maintenance functions, such as disk formatting or accessing non-Appleworks files. When you've finished your tasks, you can return directly to Appleworks or to the Appleworks file you were using last. And if you choose to delete an Appleworks file, the program makes you verify that choice. It is almost mistake-proof.

One thing I miss, however, is a buffer in the word processor that would store deleted text in case I wanted to put it back. I'd gladly sacrifice some of the RAM used to store files in exchange for a delete buffer.

One other annoyance worth mentioning is that Appleworks uses all manner of strange control characters, which creates a minor problem when you want to send information over the wires in an ASCII-dominated telecommunications world. In most instances, you'll have to convert your work into straight ASCII files before you can send

At a Glance

Name: Appleworks

Type
Integrated package: word processing, database, spreadsheet

Manufacturer
Apple Computer Inc.
20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010

Price
$250

Format
5¼-inch floppy disks

Computer
Apple IIe and IIc. Two disk drives and 128K of RAM (for IIe) recommended

Documentation
319-page spiral-bound manual; 140-page spiral-bound tutorial

Audience
Home and small-business users

them electronically. Thankfully, this is a fairly straightforward process, which you can initiate via a menu option. Appleworks cannot retrieve ASCII files, however, so plan ahead and do the ASCII conversion only when you're certain you won't have any revisions.

Appleworks comes with an on-disk tutorial, a tutorial manual, and a reference manual. It is good documentation, worth taking the time to read so you can use Appleworks to its fullest potential.

As a business package, Appleworks is missing only a graphics program. But if something had to be left out, I'd rather make do without graphics than without the word processor, database, or spreadsheet.

If Applework's level of integration went beyond merely sharing data to automatic updating of information throughout the program when data in one module was changed, the combined package would have been a much more powerful business aid. As it is, however, considering its limitations in RAM and disk memory, Appleworks does an admirable job of putting the Apple IIe and IIc through their paces. □

WRITING TOOLS

Thor

Organize your thoughts with this combination word-processing and database management program

by Howard Kaplan

Planning a meeting, writing a research paper, or setting up an ever-changing monthly schedule can be a challenge. Thoughts crash randomly into your mind faster than you can deal with them: Ms. Quinn can't make it on the 5th, lobster bisque would be perfect for the Tuesday luncheon, third-quarter earnings were up by 12.5 percent. You frantically scribble down notes and try to get a grip on your brainstorm. But many of your best ideas get lost in a maze of unfocused thoughts, time-consuming details, and miscellaneous slips of paper.

Thor, an integrated word processor and database management program, helps you organize thoughts by providing an environment where you enter your thoughts as text in a word processor and categorize them in a database. The categories or pigeonholes you create in the database, such as date, subject, key word or phrase, give you easy access to the text for retrieval at a later time.

Howard Kaplan is the director of the Center for the Study of Computers in the Classroom, based in Cambridge, Massachusetts.

The advantages of this setup quickly become clear. Fast entry of random thoughts is simplified by the quick shift from word processor to database and back again. To selectively recall your thoughts, you use various categories and criteria to scan the database: you can search for words or phrases, sort by alphabetical or numerical order, and use logical operators to select text files that are equal to, less than, or greater than criteria you've set up. And after the initial entry of text, you can amend your thoughts, add to them, and place them in different categories.

Putting Thor to Work

Imagine setting up a series of training seminars, a project that involves coordinating staff at a number of counties in Northern California on different dates. With Thor, you create an application called California. (An application, or file in database terminology, is similar to a drawer of a file cabinet.) You enter a topic for one of the seminars (a record in database management terms) such as Telemarketing Strategies in Marin County, press the F1 function key to enter the word processor, and begin typing. You have 25 screenfuls for each topic—enough room for plenty of thoughts. When you're finished with the word processor, you enter Thor's database where you subdivide the topic into categories (field titles) you'll use for retrieval, such as Speaker, Date, and so on.

After you enter the pertinent text for the rest of the counties, you can easily read or scan the entire California file and print out all the entries or select only the files of counties after a certain date. For example, if you need to recall where Mr. Smith is going to talk on telemarketing after July 5, 1985, and before August 7, 1985, simply enter Mr. Smith, telemarketing, and the inclusive dates in Thor's database. In a matter of seconds, Thor places on the screen the county that fits the criteria. This kind of organization lets you concentrate on the big stuff; the software minds the details.

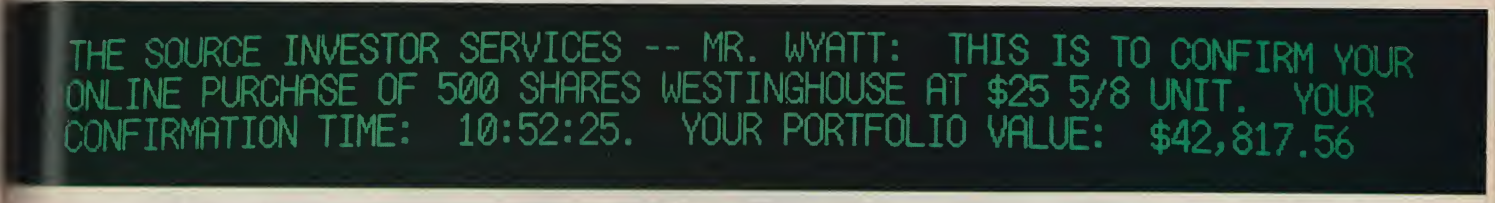
Unique Features

How is Thor different from a word processor or a database? At most, word processors search for a key word or phrase in one file at a time; Thor searches for them in as many files as you've included in a particular application. Thor can go quickly from one file to another; with a word processor you have to wait as the program retrieves a new file each time. A database can manipulate only limited amounts of text; with Thor, you can manipulate entire files. In a nutshell, what makes Thor unique is that it lets you quickly and easily search for, sort, and select a large amount of text from a large number of records according to your own criteria.

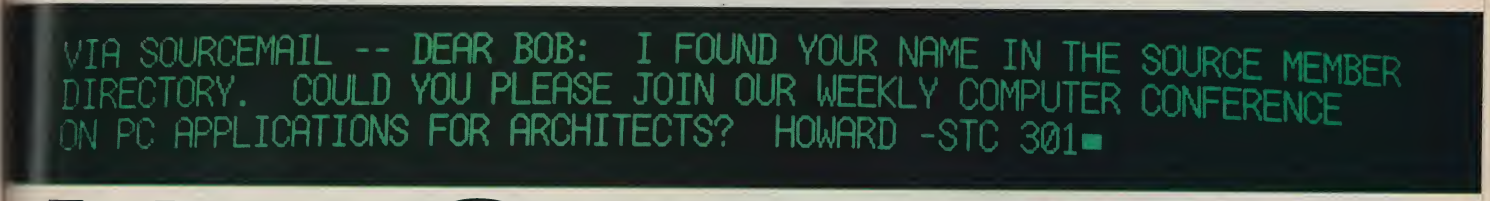
Thor's word processor has most of the items you would want in a sophisticated word processor. But curiously enough, it lacks block move and insert functions for moving words, sentences, or paragraphs from one part of the text to another.

Also missing from Thor's word processor is the capability to find particular words in the text and

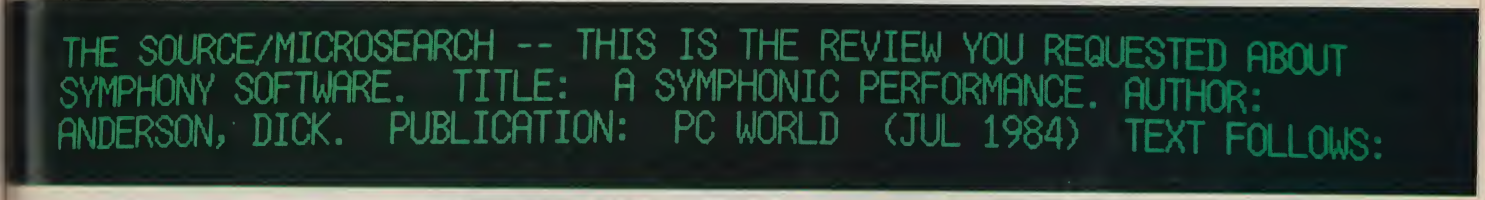
Not Dow Jones.



Not MCI Mail.



Not CompuServe.



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Inquiry 71

replace them with others.

You'll have no need for guesswork when using Thor—the program's menus are supplemented with tailored help screens. Thor's use of functions keys for menu selection makes moving around the program a snap. The documentation is clear and to the point but would benefit from specific examples of how to use Thor in different kinds of circumstances—sort of priming the pump. (A company spokesperson says this is in the offing.)

Giving Order to Chaos

When you are at the computer, Thor is a genuine help in handling the details involved in the thinking process. By helping you quickly enter, categorize, and recall thoughts, the program leaves you free for weightier matters such as reviewing or reconsidering thoughts. Such a second look often yields valuable insights about how seemingly different and even chaotic thoughts relate to one another. While using Thor won't always guarantee brilliant breakthroughs, it does let you concentrate on your best ideas and leave the grunt work for the computer. □

At a Glance

Name: Thor

Type
Integrated word-processing and database management program

Manufacturer
Fastware
200 Freeway Drive East
East Orange, NJ 07018
(201) 676-7963

Price
$295

Format
5¼-inch floppy disk

Computers
IBM PC and PC-compatibles with 128K bytes of random-access memory

Documentation
31-page softcover manual

Audience
Business people, writers, students, and researchers

EDUCATION

Homer Sharpens Prose Style

This electronic critic helps you trim the fat from flabby writing

by Peter Owens

The biggest technological revolution since the pocket calculator will soon strike the classrooms of America. When it does, the question "Why can't Johnny write?" will become "When can we get Johnny one of those fancy writing programs?"

Sophisticated new word-processing software designed to coach students at virtually every level of the writing process will engender this revolution in education. This new software will help beginning writers generate ideas and guide them in structuring and revising their writing. As they write, they'll have instant access to a host of editing tools that will reveal their errors and teach them to avoid pitfalls. The computer will help writers spell and punctuate correctly. An electronic dictionary/thesaurus will supply alternate words at the touch of a key, encouraging them to experiment. The software will analyze writing style, check grammar, and tighten expression.

The Shape of Things to Come

Virtually all of the software required for such comprehensive writing guidance now exists, but it's not yet available as a unified system. Some of the assistance can be found in various word-processing packages on the commercial market, while other pieces are now being masterminded by thinkers at major universities. UCLA is currently developing a program called Wandah that will combine many of these coaching elements, but so far the ultimate computerized electronic writing teacher remains in the formative stages, its parts sprinkled here, there, and everywhere.

One of those parts, a style-analysis package called Homer that was created by the UCLA Wandah project's Michael Cohen and Richard Lanham, charts the tricky waters of computerized style instruction. Published by Scribner's college textbook division, the program quickly assaults the "lard factor" that, in Lanham's words, makes sentences "go on and on, as if they were emerging from a nonstop sausage machine." Although designed for students, the program may be even more useful for business professionals, administrators, and bureaucrats who have been seduced by what Lanham calls the "official style" of their disciplines.

Basically, Homer reveals those stylistic mannerisms that characteristically produce flab and obscurity in writing. The program does not, however, correct such stylistic weaknesses. Rather, it draws attention to bad habits that you can easily correct once you're aware of them. In this way, Homer shows you where to trim your writing at the same time that it fosters a new level of critical awareness.

Designed for Apple II microcomputers running the Apple Pascal system, Homer requires that you enter your writing into the Pascal text editor. The electronic tutor then begins its analysis. For starters, it counts the words in each sentence, displays its findings on a single horizontal bar graph so you can get the overall picture, and calculates average sentence length.

A widely used readability axiom maintains that longer sentences are

Peter Owens teaches writing at Southeastern Massachusetts University and writes software for Compress and Houghton Mifflin.

replace them with others.

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At a Glance

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Type
Integrated word-processing a
database management progr

Manufacturer
Fastware
200 Freeway Drive East
East Orange, NJ 07018
(201) 676-7963

Price
$295

Format
5¼-inch floppy disk

Computers
IBM PC and PC-compatibles
bytes of random-access mer

Documentation
31-page softcover manual

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Business people, writers, stu
researchers

EDUCATION

Homer Sharpens Prose Style

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Basically, Homer reveals those stylistic mannerisms that characteristically produce flab and ob-

generally more difficult to read, and Homer warns of this pitfall when it reports average sentence length. Moreover, when it encounters a sentence over 40 words long, the program chides, "Too long." Homer's also concerned about variety. If you consult *Revising Prose*, Lanham's enjoyable and highly readable companion text, you'll find that varying sentence length can sharpen the emphasis and punch of your prose. Homer's sentence-graphing feature makes it easy to see the variety or monotony of your sentence structure, and Lanham's manual suggests methods for improving singsong writing.

How long should a sentence be? Ernest Hemingway's first 11 sentences in *The Old Man and the Sea* average 22.64 words each. Homer reported that two of these were too long, and I would agree. Wondering if my own writing could stand up to Hemingway's, I randomly selected a 219-word passage from an article I published last year. Finding that I had used 16 sentences with an average length of 13.69 words, Homer had no complaints. But a sample bureaucratic memo averaging 23 words per sentence caused Homer some problems. If you shoot for an average 15 to 20 words per sentence—sometimes shorter for emphasis—Homer will treat you well.

Homer also identifies prepositions as a common lard factor. Prepositions often create unnecessary complexity, particularly if they're packed between subjects and predicates. In assessing preposition use, Homer nailed Hemingway with the following remark: "Overabundant prepositions and/or infinitives—HOW DISTURBING !!" Ernest used them at a rate of 2.91 per sentence. Homer's advice, in a very trim tutorial available through a Help command, dictates one or two prepositions per sentence. Having used prepositions at a rate of 1.31 per sentence, I heard from Homer, "Not bad—you've squeezed out excess prepositions."

Although my bureaucratic writing sample was guilty of 4.0 prepositions per sentence, it got the same scolding Hemingway's did. This reflects a weakness in the program. Despite the risk of being arbitrary, Homer should provide a greater variety of more specific responses.

To Be or Not To Be

Heavy dependence on forms of the verb "to be" is also a sore spot for Homer. *Is*, *are*, *was*, and *were* lack punch and foster reliance on the passive voice. Once a verb is in passive voice, accompanying nouns tend to lose crispness: "Johnny was punched by the principal" is the passive form of the more direct "the principal punched Johnny." Homer faulted Hemingway for using 1.18 "to be" verbs per sentence, and even

a sample passage of text averaging .9 "to be" verbs per sentence prompted Homer to suggest fewer. My passage, with .37 per sentence, evoked the comment, "You control your 'to be' verbs quite nicely."

Of course, I'm flattered that Homer likes my writing, but I must defer to Hemingway as the master stylist. In no way can Homer evaluate the power of words as images or decide when prepositional phrases or "to be" verbs might be effective. In general, however, Homer's statistical sweep reveals useful patterns. After a few days' fiddling with the program, I found myself revising and polishing my sentences as I wrote them. I am more conscious of the fat in my writing and am making adjustments.

Bureaucrats addicted to officialese will benefit from Homer's attention to "shun" and "woolly" words. A shun word, according to the Help tutorial, "is often a verb or adjective that has died and become a noun." Homer locates such words by reading -sion and -tion endings. These words, according to Lanham, often appear "in sentences that have very weak or abstract verbs" or "whenever a writer wishes to sound important." Thus, the sentence "The situation in education is an abomination" would practically strangle Homer. Cohen and Lanham would prefer "Our schools are failing."

Woolly words, on the other hand, are weak excuses for more precise words. The guilty parties include *aspect, factor, process, basis, facet, perspective,* and similar flaccid verbosities. With a dictionary of woolly words and a count of -tion and -sion endings, Homer helps writers shake the official style. As Lanham points

At a Glance

Name: Homer

Type
Stylistic analysis and instruction

Manufacturer
College Department
Charles Scribner's Sons
597 Fifth Ave.
New York, NY 10017
(212) 614-1300

Price
$100 for Homer and *Revising Prose* style manual (direct order from manufacturer only); additional program disks available for $15 each, or $10 each for quantities greater than five

Format
One 5¼-inch floppy disk

Computers
Apple II or II Plus with 48K bytes of RAM and Language Card or comparable 16K-byte memory expansion; Apple IIe with 64K bytes of RAM; requires Apple Pascal version 1.1 or later ($250) and two disk drives; IBM PC and PCjr versions scheduled for release in 1985

Documentation
120-page user's manual and 126-page companion style manual

Audience
College and high school students and teachers; professionals and administrators who need to improve conciseness and style in writing

out, "Used unthinkingly, the official style provides the quickest tip-off that you have become system-sick, and look at life only through the system's eyes. It is a scribal style, ritualized, formulaic, using a private vocabulary to describe a particular kind of world. And it is, increasingly, the only kind of prose style America ever sees."

Using Homer

To use Homer, you'll need Apple Pascal 1.1 or 1.2 ($250)—a major requirement for running a $100 applications program. You first load Pascal in disk drive 1 and then load Homer as a Pascal file from drive 2. Although clear directions in the user manual make this process easy enough, dependence on Pascal's rather cumbersome and inflexible text editor creates more busywork than most students or teachers will welcome. Once Pascal and Homer have been loaded, you enter your own text via the Pascal editor. When you're ready, Homer will analyze your prose on the screen and, as an option, provide a printout of both your text and its critique.

An add-on file called Sartor lets you create new "woolly" word lists, modify the comments in Homer's critiques, develop custom instructions or lessons in the Help program, and adjust the "triggers" (such as 40 words per sentence) that activate Homer's evaluations.

Homer's biggest drawback is that it doesn't work in concert with one of the popular, easy-to-use word-processing packages commonly found in schools and businesses. Eventually programs like Homer will be available not only to check style but also to offer instruction, and you'll be able to buy them for your own word-processing system. Meanwhile, though, you'll have to make do with a less integrated package, enduring awkward requirements such as Homer's dependence on Apple Pascal.

Marketed as a companion disk for Lanham's *Revising Prose*, Homer marks Scribner's first and only foray into software publishing. While the software complements the style manual nicely, Homer can stand alone as a useful style teacher. Because the Pascal editor allows files of up to 2500 words, you can produce moderate-sized compositions within the system itself. But Homer does not check spelling, punctuation, grammar, or most structural elements—it is not the ultimate writing teacher.

Still, teaching the elements of style is difficult, fussy work that requires rapid feedback and much fiddling and experimentation on the writer's part. On this count, Homer rates as an excellent instructional tool in its own right. And as a first look at things to come, it's an exciting software development. □

GAMES

Seastalker

This adventure game lures the younger set away from arcades into icy Atlantic waters

by Monte Schulz

When faced with the dire prospect of reading, kids invariably prefer to spend their quarters on video games and their time on cartoons, right? Not necessarily, according to Infocom, the company that created the best-selling adventure games Zork, Witness, and Deadline. In fact, Infocom is betting that something worth reading—a well-written program aimed at the imagination—will encourage kids to abandon fast-action arcade games or colorful high-resolution adventures. To this end, the company has created Seastalker, an all-text adventure game designed expressly for a junior audience.

Through Murky Waters

The plot of Seastalker is simple: a strange creature—the snark—is attacking the undersea research station Aquadome, and you, as a famous inventor and one of the leading members of the Discovery Squad, are the only one talented and able enough to stop it. You'll meet up with nine characters (besides the beastly snark), some of whom are friendly and helpful (Tip Randall, Doc Horvath, among others), and a few who are decidedly not. The game package includes a brief but informative dossier on each character, as well as descriptions of most of the equipment you are likely to use or come into contact with on your mission.

You'll face many tasks on the way to your final confrontation with the deadly snark. In addition to preparing the submersible Scimitar for combat, you need to unravel several subplots. And as in other Infocom adventure games, you have to make a few mechanical repairs as well as avoid a couple of death traps.

You won't be alone, though. Your trusted buddy Tip Randall will follow you around offering advice on a number of these puzzles while providing a special kind of moral support. Randall and the other supporting personalities in the game add to your sense of involvement with the story. You become easily immersed in the plot and soon feel just like another character in the narrative. Few other games, even among Infocom's adventures, offer players this kind of integration with the story.

The best part of the game is piloting the Scimitar through the murky waters of Frobton Bay and out into the cold Atlantic. A split-screen graphic representation of the sonarscope readout helps you maneuver around obstacles (sandbars, ships, and so forth) and adds a little flair to what is still a decidedly cerebral adventure. The game's documentation provides a map of the bay, but you'll probably have more fun cruising around underwater looking for the opening in the seawall on your own. Whatever you do, pay attention to the depth finder and the heavy sea traffic on the surface of Frobton Bay.

With many little puzzles to solve and at least four major characters to deal with, Seastalker feels easy only when in the course of the game you are invited to consult the hint cards included in the package. Without any hints, the level of difficulty is comparable to that of several other Infocom adventures, even though it's intended for a juvenile and beginning audience.

Meeting the Challenge

It's no surprise that a few logistical problems arise with text games for a young audience. The most obvious concerns the way this game is

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played. Every action requires a little typing. You have to type commands such as "Pick up the videophone then turn it on," "Open the access panel with the universal tool," "Read the article in the magazine," and "Commander Bly, tell me about the monster." If you can't type, the game will move along a little slowly. On the other hand, with computer keyboards becoming increasingly visible items in our society, gaining familiarity with one is valuable, and certainly anyone who plays Seastalker will be a better typist when he or she finishes.

A second issue concerns the amount of reading involved. In one instance, you've just finished piloting the Scimitar around Frobton Bay and out into the Atlantic to the Aquadome. The sonarscope graphic was helpful, the commands were all short and concise. You enter the Aquadome reception area and ask Commander Bly about the "private matter" she wanted to discuss with you. Suddenly the whole screen fills up with text. Your initial reaction is "Do I have to read all that?" Well, of course you do. Seastalker is, after all, a text adventure game—the words stimulate the imagination and set the scene. Moreover, "all that" is about two paragraphs in a book.

Neither of these issues ought to be considered a drawback to playing Seastalker. Typing and reading are desirable skills to possess, and few pieces of educational software offer a comparably enjoyable way of developing these skills.

I suspect that many juvenile players will prefer Seastalker's challenge—piloting a submarine and stalking the snark—to playing yet another ho-hum round of an arcade game. I also suspect that some not-so-young adventurers may end up competing with the younger ones for a turn at the keyboard. □

At a Glance

Name: Seastalker

Type
Text-adventure game

Manufacturer
Infocom Inc.
55 Wheeler St.
Cambridge, MA 02138
(617) 492-1031

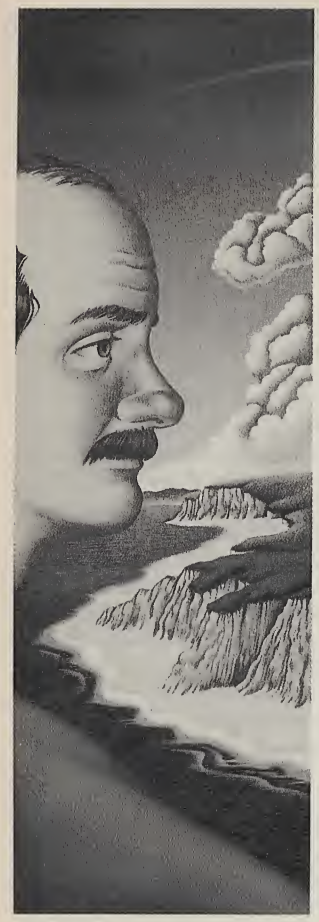
Price
$39.95; $34.95 for Atari and Commodore versions

Format
5¼- and 8-inch disks

Computer
Apple II, Macintosh, Atari 400/800, IBM PC, NEC PC-8000 and Advanced Personal Computer, TRS-80 Models I and III, Commodore 64, Osborne 1, TI Professional, and any CP/M-based system with 8-inch disk drive; requires 32K bytes of random-access memory and one disk drive

Documentation
Game manual, Logbook, nautical chart of Frobton Bay, Hidden Clue cards, Discovery Squad decal

Audience
Beginner adventure-game enthusiasts ages 9 and up



Certainly in the realm of integration, companies such as Ashton-Tate and Lotus Development have already left Valdocs in their dust.

CONTINUED FROM PAGE 65

subscript, it was still slow. The business graphics were good, but the graphs, although they could be scaled from postage-stamp size to full screen, could not be moved into the text editor.

The spreadsheet figures in Valdocs 2.0 could be translated into graphs but again they couldn't be moved into the text editor or the card file. "That's the next step," Rutkowski said. "It's evolutionary."

The Unveiling

Like other versions, Valdocs 2.0 was late in arriving—months later than it was supposed to be. Six weeks before its proposed late-1984 release date, various bugs were still floating around within Valdocs 2.0. The reason for this, Rutkowski said, is that a version would be stabilized and readied for release, then Epson would delay release, and then Rising Star would add or change the program again, creating new bugs.

That didn't explain why six weeks before the proposed release date the Valdocs manual was still in pieces. It didn't explain why at that late date Epson had yet to approve 2.0 for release at all.

Even assuming that the Epson QX-16 and Valdocs 2.0 make it onto the market in early 1985, it seems unlikely they will have much impact on the computer world as we know it today. Rutkowski's Valdocs, while conceptually strong, is still in development—imperfect, if you will.

For reasons only he knows, Valdocs 2.0 doesn't take advantage of the QX-16's 16-bit coprocessor. Despite Rutkowski's insistence that the Z80 can handle the enormity of Valdocs, it seems that the processor is straining. Valdocs 2.0 continues to suffer from speed problems, especially when making block moves in the text editor. Because so many things go on in background—for example each time a document is stored it is automatically indexed by date—functions such as saving a file take a very long time.

That Rutkowski agrees work still needs to be done on Valdocs is both reassuring and distressing. It is reassuring because it reaffirms what anybody who has ever met him suspects—he's a bright guy, worthy of the task he has undertaken. It is distressing because Rising Star has a history of giving us too little too late.

Because in reality, as charming as Rutkowski's notions are, HASCI has not become a standard, and it doesn't look like it ever will. One can't help but wonder whether Apple, with its Macintosh, won't whisk past Rising Star. Certainly, in the realm of integration, companies such as Ashton-Tate and Lotus Development have already left Valdocs in their dust.

Once again, there is a lot to love about Valdocs. Rutkowski is especially banking on his draw and paint programs, which allow you to zoom in on the screen and create images pixel by pixel. In demonstation these programs are wonderful, and Rutkowski thinks they are flashy enough to sell computers.

Perhaps Rutkowski is right, and thousands—even millions—of people out there are looking for a computer that is easy to use, and perhaps they are willing to trade some of the annoyances of learning to use other computer programs for some of the annoyances of Valdocs.

Epson hopes so—but the company is hedging its bets anyway. At the unveiling of the QX-16, Epson announced that it is also starting its own software company to develop products for the QX-16. (Rutkowski and Epson both claim the new company will not compete with Rising Star.)

While Rutkowski says he hopes to have a long and lucrative relationship with Epson, he claims to be unconcerned about whether the public accepts the QX-16 or Valdocs 2.0. The way he sees it, sooner or later the world will recognize the value of what he is doing. Rutkowski, remember, is a futurist. He takes the long view. "I'm already past 2.0, and the design work for 3.0 is already complete," he says. He's ready for other projects, and soon, he says, he will be done with computers altogether.

Rutkowski talks, you see, not in terms of selling computers, but in terms of setting historical precedents, of bettering the lot of mankind, of being remembered long after names like Macintosh and IBM PC are forgotten.

"I'm here to research the leading edge of technology," Rutkowski says. "I'm trying to create technology by which mankind can improve existence on this planet."

It is an awesomely long way from Valdocs 2.0 to such a heady dream. But the longest journey begins with a single step, they say. And anyway it might explain why some of what Rutkowski does is so mystifying to the rest of us. After all, in his league what does it matter if you have full integration this month or next?

Come to think of it, in his league what does it matter whether you ever sell a computer? □

Gödel's Theorem: The paradox at the heart of modern man

In the summer of 1930, at age 24, mathematician Kurt Gödel proved a strange theorem: mathematics is open-ended. There can never be a final, best system of mathematics. Any mathematical theory we can describe is incomplete; that is, any theory we invent, sooner or later, will run into certain simple problems it cannot solve. This is Gödel's Incompleteness Theorem, and when Gödel received an honorary degree from Harvard University in 1952, the citation termed his achievement the most important advance in mathematical logic in a quarter century.

For those of us who aren't familiar with higher mathematics, the import of Gödel's Theorem is somewhat hard to understand. In fact, when the original paper appeared, it probably was unintelligible to many professional mathematicians. But philosophically, it turned the ordered world of mathematics upside down. Never again would math be a closed system, ultimately provable by its axioms. To the pure mathematician, this meant infinite room for the queen of the sciences to evolve and grow. And eventually, the theorem's impact subtly changed the layman's view of his universe.

Generally speaking, a mathematical theory is formulated in a specialized language—a language including things like numbers, variable symbols, and so on. Some "sentences" in this specialized language are taken as the axioms, or basic assumptions, of the theory. By combining these axioms according to certain definite rules, we produce logical proofs. A proof is really just an orderly sequence of sentences, with the last sentence of the proof the thing that is being proved. Something that is proved in this manner is called a theorem.

Eventually, people realized that the notion of "a mathematical theory" is equivalent to the more concrete notion of "a program for generating sentences." Any mathematical theory can be turned into a certain kind of computer program that successively prints out all the theorems that the original theory would have proved. It is this connection between concrete machinery and abstract theory that gives modern mathematical logic its importance.

As an example of a mechanized theory, consider euclidean geometry. Alred Tarski showed that it is possible to write a computer program that prints out, one after another, every theorem that can ever possibly be proved from Euclid's five postulates. What makes the euclidean geometry program particularly powerful is that it is complete. That is, given any sentence *S* about euclidean geometry, either *S* or *not S* will show up in the theorem list sooner or later. If the Greeks had known this program, then they wouldn't have needed Euclid!

Let's say you want to know if a triangle's three angle bisectors always meet in a point. All you have to do is sit down and watch the euclidean-geometry program's printout until it says either "A triangle's three angle bisectors always meet in a point," or "A triangle's three angle bisectors do not always meet in a point." Anyone who has worked with computers will realize that you may have to wait a very long time—perhaps billions of years—but at least you will not have to wait forever. The fact that the geometry program is complete guarantees a finite wait.

Of course geometry isn't all of mathematics. Geometry talks about points and lines but not about numbers, which aren't so finite. As soon as a mathematical theory is broad enough to deal with the manipulation of natural numbers, then Gödel's Theorem becomes important. As numbers approach infinity we go beyond what is provable with axioms in a finite mathematical system. In other words, it is impossible to construct a mathematical system that contains all the axioms that can be formulated within the language of arithmetic. When we prove one, another awaits—ad infinitum. Whenever I create a program *p* to print out true sentences about numbers, the program will be incomplete. Let's take one of these sentences and call it *Gp*, the Gödel sentence for the program *p*. This true sentence states that neither *Gp* nor *not-Gp* (the negation of the sentence) will ever appear in the list of theorems.

If you think about it logically, you can see why *Gp* must in fact be true, yet not provable by *p*. We are assuming that *p* prints all true sentences, but that *Gp* is a true sentence whose property is that it cannot be printed by *p*. There's a paradox working here.

A number of philosophers think that Gödel's Theorem has something to do with the question of whether computers will ever "think" just like human beings. Can a machine understand our paradox? Perhaps not now, although we may be creating the conditions for such an evolution. And are we really just complex machines ourselves? In *The Freedom of the Will*, J. R. Lucas of Oxford argues that the very fact that we understand Gödel's Theorem means we are not machines. Briefly, his argument goes like this. Suppose someone writes a program *l* and tells Lucas that it is designed to print out exactly those sentences which Lucas will, sooner or later, say to be true. Lucas now claims that he can find the Gödel sentence *Gl* for *l*, and that he can see that *Gl* is indeed true. But based on Gödel's Theorem, the program *l* will never print *Gl*. So Lucas is in fact smarter than the program *l*!

Most theorists, myself included, think Lucas is wrong. The flaw in his argument is that the Lucas program *l* will be so complex that he will never actually find the sentence *Gl*. Perhaps what Gödel's Theorem really tells us is that we may indeed be sophisticated machines, in the broad sense, but that our programs are so complicated we'll never understand them.

In any case, Gödel's Theorem is a rare example of a mathematical result that matters. Mathematics is richer and more complex than anyone before Gödel had suspected. Mathematics may be on the brink of solving some of the oldest philosophical puzzles about free will, consciousness, and the nature of reality.

In the final analysis, we may be open-ended, too.

—Rudy Rucker

Rudy Rucker is a novelist and mathematician. His book *Software* (Ace) deals with intelligent robots, and his popular-science book *Infinity and the Mind* (Birkhauser) contains one of the best popular discussions of Gödel's Theorem.

NEW SOFTWARE

Business

Able One Mailing List provides space for adding four categories of information in addition to the standard name and address data. The menu-driven program prompts you through file creation. Its five print formats will accommodate different-sized labels. Mailing list size is unlimited because all your data resides on disk. For **CP/M-based systems** with 48K-bytes of memory and two disk drives; $19.95. Able Data Software, POB 86923, North Vancouver, British Columbia, Canada V7L 4P6.

dbMAN, a relational database program, provides a good selection of features. Included are global and local memory variables, an English-like programming language, and the ability to open 10 active files simultaneously. The program supports 64 fields per record, 2000 bytes per record, and 65,535 records per file. It can sort 1000 records in under two minutes. dbMAN is 90 percent command-compatible with dBASE II. For **MS-DOS-based** systems; $175. Versasoft Corp., 723 Seawood Way, San Jose, CA 95120.

Flow Charting, a package for constructing and printing both flowcharts and personnel charts, includes all standard flowcharting symbols plus many additional characters and three line styles. It lets you create, relocate, and duplicate images and symbols. Works with a dot-matrix printer. For the **IBM PC** and **XT**; $167. Patton and Patton, 340 Lassenpark Circle, San Jose, CA 95136.

Magic Office System integrates a word processor, an on-line spelling checker, a spreadsheet, and business graphics. The four individual programs are combined and accessed through a central operating system that simulates a filing cabinet. Information can be exchanged among all the programs. For the **Apple IIe**, **IIc**, and **Franklin**; $295. Artsci, 5547 Satsuma Ave., North Hollywood, CA 91601.

MICA Payroll, for small- to medium-sized businesses, provides multiple employee wage rates within a pay period and the distribution of individual employee earnings to multiple general-ledger accounts. The program handles up to 256 different taxing entities and conforms to the latest government regulations on employee tips. For the **HP-150**, **AT&T 6300**, **Docutel-Olivetti PC**, **TI Professional**, and **IBM PC** and compatibles; $495. Micro Associates, 2349 Memorial Blvd., Port Arthur, TX 77640.

Plain Vanilla Stock Portfolio System includes three programs that cater to different levels of investor expertise. The Investor, $99.95, provides limited portfolio investors with a simple way to track their holdings. The Manager, $129.95, is for those who maintain larger or multiple portfolios and those with an interest in options writing. The Professional, $159.95, is for investors who require automatic data retrieval from the Dow Jones News/Retrieval Service. For the **IBM PC** and **Apple II** family. Iris Communications, 660 Newport Center Dr., Newport Beach, CA 92660.

Professional's Time and Billing System provides 999 user-defined billing codes, automatic file updates, interactive time and expense transactions, and the ability to manage three different hourly rates. The menu-driven system also prints aged accounts receivable and finance charges, generates a variety of reports, and offers hard-disk compatibility. For most **CP/M-** and **MS-DOS-based** systems; $2495. Stillwater Software, POB 82, West Milton, OH 45383.

Simulations, a statistics package, lets you analyze past experiences and explore future possibilities. It includes GASS, a program that simulates 10 variables at a time and combines them into a single user-defined algorithm, and Monte Carlo Simulations, a program that offers both statistical analyses and simulation capabilities. For the **Apple II** and **IBM PC**; $395. Actuarial Micro Software, 3915 A Valley Ct., Winston-Salem, NC 27106.

Spotlight provides a set of desktop management programs. Included are an appointment book, DOS filer, phone book, notepad, index card file, and calculator. The system runs alone or in background with Lotus 1-2-3, Visicalc, Wordstar, dBASE II, Symphony, and other popular programs. For the **IBM PC**, **XT**, and **Compaq**; $149.95. Software Arts, 27 Mica Lane, Wellesley, MA 02181.

Superex Clothing Store is a point-of-purchase program for retail clothing merchants. The menu-driven system handles price quotes, inventory control, sales tax, receipts, invoices, and customer mailing lists. It also includes a report generator. For the **Apple II** and **IIe** and **IBM PC** and compatibles; $800. Superex Business Software, 151 Ludlow St., Yonkers, NY 10705.

Project Planner

An idea processor and project management tool, Project Planner offers the basic capabilities of the Critical Path Method. It helps you plan, organize, schedule, control, and monitor a project; focus on critical activities; perform what-if analyses; communicate; and prepare presentations and proposals. The program generates a flowchart and schedule automatically, filtering inconsistencies. For the ***Apple II Plus, IIe,*** *and* ***IIc,*** *requires 64K bytes of memory and two disk drives; $150. Applitech Software, 381 Harvard St., Cambridge, MA 02138.*

New Software provides up-to-date listings of recent releases in microcomputer software. Descriptions are based on information supplied by the manufacturers and are not to be considered endorsements of the products. Companies continually offer new versions of popular programs for different machines. Please check with the manufacturer or a dealer to find out if a program is available for your computer. For in-depth evaluations of some of these programs, see our Software Review section.

Tax Decisions allows professional tax planners and financial advisers to maintain five basic strategies per client and to test variations with a single entry. The program follows the IRS Forms and Schedules formats and integrates entries and calculations among them. Includes built-in tax tables. Built-in communications software gives you access to Compuserve's Executive Information Service, featuring the IRS Tax Information Database. For the **IBM PC** and compatibles; $279. Eagle Software Publishing, Suite 405, Old Eagle School Rd., Wayne, PA 19087.

Education

ABIO teaches spreadsheet users how to analyze business investment opportunities. Concepts such as present value, future value, discount rate, net present value, and internal rate of return are defined, explained, and explored. Available in Lotus 1-2-3, Visicalc, Multiplan, and Supercalc 2 versions. Includes instructional and template disks. For the **Apple II** and **IIe** and **IBM PC, XT** and compatibles; $69.95. Cdex Corp., 5050 El Camino Real, Los Altos, CA 94022.

Auto Test Authoring lets teachers write original test and drill programs. The menu-driven program features four test formats and automatic grading and security options. Works equally well with math- or language-oriented quizzes. For the **DEC Rainbow 100**; $89.95. Resource Software International, 330 New Brunswick Ave., Fords, NJ 08863.

Early Music Skills is a music instruction program for young children. In game format, the program asks a series of increasingly difficult questions on various musical topics. It displays notes on lines and spaces and melodic movement by steps and skips. For the **Apple II** and **IIe** and **Commodore 64**; $29.95. Electronic Courseware Systems, 309 Windsor Rd., Champaign, IL 61820.

Expertype is an electronic touch-typing teacher that provides 12 lessons in a variety of formats. The program creates individual learner profiles, measures the amount of time required to move from key to key, and checks typing accuracy. An on-screen "report card" shows your typing speed and where you still need practice. For the **Coleco Adam**; $49. Coleco Industries, 999 Quaker Lane South, West Hartford, CT 06110.

For Teachers Only is designed to acquaint teachers with computers and their classroom value. Used in either small workshops or on an individual basis, the system has eight activities that provide a complete computer overview, ranging from guidelines for software evaluation to a keyboard description. Different educational software applications, teaching methods, and classroom activities are also explored. For the **Apple II** family; $60; requires color display. DCH Educational Software, D.C. Heath and Co., 125 Spring St., Lexington, MA 02173.

Test Master lets teachers generate tests and quizzes using a variety of strategies. Question formats include true/false, multiple-choice, essay, and short-answer. Once a test has been created it can be printed in as many variations as desired, complete with an answer key. For the **Apple II** family. Micro Software Publishing, POB 6886, Tallahassee, FL 32301.

The Great Creator is a multilingual questionnaire generator. The program, which handles multiple-choice, true/false, and fill-in-the-blank formats, supports 16 languages, including English, Spanish, French, Italian, and German. Displays accented letters without requiring additional hardware. For the **Apple II** and **IIe**; $399.95. The Professor, 959 N.W. 53rd St., Fort Lauderdale, FL 33309.

Games

Bank President is a role-playing banking simulation. As the head of a major U.S. bank, you must set loan and interest rates, buy and sell securities, issue and redeem stock, pay dividends, and react to changing economic and regulatory situations. The object of the game is to outperform competing banks while improving your institution's earnings growth, profits, and stock value. Includes over 70 types of charts and graphs. For the **IBM PC** and compatibles; $74.95. Infoware Corp., 2407 12th Ave. South, Nashville, TN 37204.

Breakdance lets you experience the street corner fun of poppin', moon walking, stretching, and breakin' in a series of four games. In the first game you dance in contest with the famous Hot Feet. A second game involves you in a battle with other dancers as they attempt to invade your turf. A third game challenges you to figure out the sequence of steps needed to perform a backspin or suicide. The fourth game lets you choreograph your own moves and match the speed of the dancer's movements to the rhythm of one of five different breakdancing songs. In each game you control your dancer through actual breakdance moves. For the **Commodore 64**; $30. Epyx, 1043 Kiel Court, Sunnyvale, CA 94089.

Castles of Dr. Creep is a one- or two-player arcade-type game that recreates the feeling of an old-fashioned "B" horror movie. Inside 13 mysterious castles are more than 200 rooms, all interlocked in a maze-like series of three-dimensional puzzles. Sinister surprises, including force fields, electrogenerators, and meandering mummies, await all those who dare to enter Dr. Creep's domain. Spooky sound effects and eerie music contribute to the game's overall mood. For the **Commodore 64**, requires joystick; $29.95. Broderbund Software, 17 Paul Dr., San Rafael, CA 94903.

Computer Diplomacy is an electronic version of the popular board game. As the leader of an early-20th-century European nation you can form alliances, declare war, bargain for peace, create political turmoil, and conquer weaker powers. You can play against as many as six opponents or compete against the computer. The game comes with a rule book and a pad of conference maps. For the **IBM PC** and compatibles; $50. Microcomputer Games,

Compuzzler

Two teams of players race against the clock to complete an on-screen crossword puzzle. They score points by supplying correct words and challenging opponents' answers. Includes over 70 puzzles and a single-player mode. For the ***Apple II*** *family,* ***Apple Macintosh, IBM PC*** *and* ***PCjr****, and* ***Commodore 64****; $39.95. Uptown Software, Suite 3, 268 Summer St., Boston, MA 02210.*

Avalon Hill Game Co., 4517 Harford Rd., Baltimore, MD 21214.

Dreadnoughts puts you in charge of a World War II North Atlantic convoy. This historically accurate simulation includes over 40 major ships, including England's *King George V*, the U.S.'s *North Carolina*, and Germany's feared *Bismarck*. Players must cope with each vessel's speed, armor, maneuverability, rate of fire, range, and other characteristics. For the **Apple II** family; $30. Microcomputer Games, Avalon Hill Game Co., 4517 Harford Rd., Baltimore, MD 21214.

Quest of the Space Beagle is a role-playing game with an outer-space setting. Lost in an unknown galaxy many light-years from Earth, you must trace your way home while neatly sidestepping a variety of galactic pitfalls. A continuation of the Jupiter 1999 game series. For **Ataris**; $35, two disks. Microcomputer Games, Avalon Hill Game Co., 4517 Harford Rd., Baltimore, MD 21214.

Questron, a fantasy role-playing game, puts you on the trail of the diabolical Wizard Mantor. You must work hard to build your strength, stamina, dexterity, intelligence, and charisma attributes, gain information from the people you meet, and conquer a variety of hidden dangers. For the **Commodore 64**, $39.95; **Apple II, IIe**, and **Ataris**, $49.95. Strategic Simulations, 883 Stierlin Rd., Building A-200, Mountain View, CA 94043.

Trekboer, a high-resolution adventure, places you aboard a 21st-century starship. Life on Earth is threatened by a deadly virus and your mission is to search the frontiers of space for a cure. For the **Radio Shack Color Computer**; $24.95, cassette; $27.95, disk. Mark Data Products, 24001 Alicia Pkwy., #207, Mission Viejo, CA 92691.

Home

An Apple a Day, a medical information system, organizes names, addresses, phone numbers, and directions to all family medical and emergency facilities. It also keeps complete family medical records and counsels on treating and preventing a variety of common ailments. For the **Apple II** family, $79.95, and **IBM PC**, $99.95. Avant-Garde Publishing Corp., POB 30160, Eugene, OR 97403.

Colortone Keyboard

This music program consists of a touch-sensitive membrane keyboard with 25 piano-like keys, a touch strip that performs like a harp, and 14 function keys. You can choose among eight different instrument sounds; play along with 12 preset background songs ranging from classical to Technopop; select one of 12 musical scales to play in harmony with the background accompaniment; and create compositions for later playback. For the ***Commodore 64****; $79.95. Waveform Corp., 1912 Bonita Way, Berkeley, CA 94704.*

Ancestry Link is a genealogical research tool. The four-disk system features 100 user-definable entry fields, a name equivalence file, a linkage analyzer, sorting and indexing, and a variety of reports. It also includes an interactive tutorial. For the **Apple II** family; $69.95. Accelerated Logic Inc., Suite 902, 108 East 38th St., New York, NY 10016.

Cash Flow Manager, a tool for analyzing and managing your personal cash flow, also includes graphics, automatic bank statement balancing, tax deduction reports, a label maker, and flexible expense and revenue categories. For the **IBM PC**; $55. Tara Systems of Atlanta, 8055 Meadowsweet Trace, Roswell, GA 30076.

Chocolate Bytes, an electronic cookbook, for chocolate lovers offers more than 100 recipes from Grasshopper Cheesecake to Chocolate Zucchini Bread. The program adjusts recipes and ingredients to the number of servings needed. A search feature lets you scan recipes by keyword, name, or ingredient list. For **CP/M-** and **MS-DOS-based** systems; $29.95. The Software Toolworks, 15233 Ventura Blvd., Sherman Oaks, CA 91403.

HMS, a home management system, offers word-processing, electronic spreadsheet, and database management programs. The system handles budget, net worth, check management, stock security, personal finance, personal inventory, memo writing, mail list, and appointment scheduling functions. For the **IBM PC, XT, AT,** and **PCjr**; $69. Micro Architect, 6 Great Pine Ave., Burlington, MA 01803.

Mortgage Switch Calculator, an electronic spreadsheet template, compares the true cost of keeping your current first or second mortgage to refinancing your home with a new mortgage. The program works with both fixed-rate and variable-rate mortgage terms. It's compatible with Multiplan, Visicalc, and Lotus 1-2-3. Includes an audiocassette tutorial. For the **Apple II, IIe,** and **Macintosh** and **IBM PC, XT,** and compatibles; $65. AIS Microsystems, 1007 Massachusetts Ave. N.E., Washington, DC 20002.

Ortho's Computerized Gardening provides home gardeners with a plant selection guide containing data on more than 800 plants. By entering a zip code, you can get information on plants that will grow in a particular region. Also included are a calendar, electronic notepad, and detailed tutorial on 77 common gardening techniques. For the **Apple II** family and **Macintosh, IBM PC,** and **Commodore 64**; $49.95. Ortho Information Services, 575 Market St., San Francisco, CA 94105.

Work Force II offers six programs: loan analyzer, four-function calculator, line-oriented word processor, wage analyzer, checkbook balancer, and savings analyzer. Common commands and menus allow you to add or change data, change options, and move from one program to another. All programs provide printer output. For the **Apple II** family; $34.95. Core Concepts, POB 24157, Tempe, AZ 85282.

Languages

Better BASIC adds modular, structured design to traditional implementations of this popular programming language. Better BASIC incorporates features of Pascal, Modula-2, and the C language while remaining interactive. Some of its features include support for memories to 640K bytes, procedures and functions, local and global variables, recursion, and support for multiple display windows. As well, Better BASIC encourages strict data typing. For the **IBM PC** and compatibles; $199. An optional 8087 math module is available for $99 and the optional Runtime system is available for

$250 with unlimited license. Sample disk, $10. Summit Software Technology, 40 Grove St., Wellesley, MA 02181.

F77L is a complete implementation of the ANSI FORTRAN 77 standard. The system includes IEEE-standard floating-point arithmetic, recursion, break handling, optional checking, a free-format source file, and many IBM H features. For the **IBM PC** and compatibles; $477; requires an 8087 coprocessor. Lahey Computer Systems, Suite 417, 904 Silver Spur Rd., Rolling Hills Estates, CA 90274.

UCSD Pascal Development System lets **Apple Macintosh** users design Pascal application programs. The system provides access to mouse, graphics, and text fonts provided by Macintosh ROM routines; $195. Softech Microsystems, 16885 West Bernardo Dr., San Diego, CA 92127.

Technical Tools

Data Trader lets you move data from reports created by Lotus 1-2-3 to a mainframe computer. For the **IBM PC** and compatibles; $125. Ferox Microsystems, 6th Floor, 1701 North Ft. Myer Dr., Arlington, VA 22209.

DOS 4.0, an operating system, provides **Apple II** family users with a variety of enhanced capabilities. When compared to Apple DOS 3.3, the system offers 35 percent more disk storage room and a 25 percent faster program processing rate. It also provides improved file-handling capabilities, increased available random-access memory for language card owners, and 27 new programming codes. Includes a plug-in CMOS 6502 microprocessor; $95. Rune Enterprises, Suite 214, 80 Eureka Square, Pacifica, CA 94044.

DOSPLUS IV/A is a disk operating system that features a built-in macro assembler, editor, linker, and an enhanced BASIC interpreter. The system offers single-keystroke access to frequently used file operations. For the **TRS-80 Model 4**; $169.95. Micro-Systems Software, 4301-18 Oak Circle, Boca Raton, FL 33431.

Epstart

This conversion program lets Macintosh owners print text and graphics with FX- and JX-series Epson printers. Compatible with most Mac programs, including MacWrite, MacPaint, Multiplan, and Microsoft BASIC, Epstart must be installed on each Macintosh disk. This involves copying it onto the disks and identifying the printer for which it will be configured. For the ***Apple Macintosh;*** *$39.95. Softstyle Inc., Suite 205, 7192 Kalanianaole Highway, Honolulu, HI 96825.*

Sparky simulates a Hewlett-Packard-type scientific programmable calculator. The software, which uses its own programming language, handles and evaluates mathematical expressions and displays stack and user-defined memory variables. It can also read and write program and data files and provide output in standard real, scientific real, hexadecimal, octal, and binary formats. The program supports an 8087 math coprocessor. For the **IBM PC** and compatibles; $75. Blaise Computing, 2034 Blake St., Berkeley, CA 94704.

The Postman turns your computer into a full-featured Telex terminal. The menu-driven program lets you generate messages that conform to all Telex service protocols. For the **IBM PC** and compatibles, modem required; $249. Cappcomm Software, Suite 1453, One World Trade Center, New York, NY 10048.

T-backup helps portable computer users make verified tape copies of BASIC, text, and machine-language files. The backup tapes are clearly labeled with your comments and the date and time. For the **TRS-80 Model 100, NEC PC-8201,** and **Olivetti M10**; $19.95. Traveling Software, 11050 Fifth Ave. N.E., Seattle, WA 98125.

Graphics

Caddraft is an entry-level two-dimensional drafting program that allows you to create designs featuring up to seven layers. The system supports Hewlett-Packard 7470 and 7475 plotters. An optional program includes an interface for non-HP plotters plus an architectural, HVAC, and electrical symbol library. For the **IBM PC** and compatibles, $495; optional program, $295. Personal CAD Systems, 981 University Ave., Los Gatos, CA 95030.

Headliner lets you create banners and signs in a variety of type styles. Messages can be of any length and may include letters, numbers, punctuation, and common symbols. The program prints characters up to 13 inches high and supports any ASCII-compatible printer. For the **Apple II** family and **IBM PC, XT,** and **PCjr**; $19.95. Zephyr Services, 306 South Homewood Ave., Pittsburgh, PA 15208.

Raster Graphics Toolkit offers Pascal programmers an environment for interacting with raster-graphics displays. It provides basic line-drawing and filling operations and allows transfers of arbitrary raster portions between any two pixel maps. For the **Apple III**; $300. Third Wave Graphics, 501 Channing St., Palo Alto, CA 94301.

Word Processing

Crystal Writer is an object-oriented, multiuser Unix-based program. You specify the type of document you wish to create and the system automatically adjusts margins, vertical spacing, justification, tabbing, document length, and font style. The program also offers function key support, a variety of formatting commands, full editing capabilities, and plain-English commands. For **Unix-based** systems; $1000. Syntactics Corp., Suite 145, 3333 Bowers Ave., Santa Clara, CA 95051.

M-Script offers a full array of word-processing features, including full-screen editing, word wraparound, block moves, headers and footers, print formatting, and global changes. It also provides horizontal scrolling, a status line display, and on-line help. For the **IBM PC** and **PCjr, Epson QX-10, Zenith Z-100,** and **TRS-80 Models I, II, III, 4,** and **12**; $79.95. Micro-Systems Software, 4301-18 Oak Circle, Boca Raton, FL 33431.

Wordpro provides the popular features of Wordstar plus a built-in sort program, graphics, a five-function calculator, a foreign-language capability, on-screen help, a search-and-replace routine, and hard-disk compatibility. For the **IBM PC** and compatibles; $199. Rio Grande Software, 1107 Upas, McAllen, TX 78501. □

Weighty Money Matters

by Michael W. Ecker

This month's column responds to popular demand. The problem has been suggested many times during the past year, most recently by Dr. David Grossman of IBM's T.J. Watson Research Center, Yorktown Heights, New York. But his solution, which I'll show you next time, is so interesting that I decided now is the time to offer the challenge.

You have 12 coins that seem identical. All weigh the same, with one possible exception. There may be one slightly lighter or heavier counterfeit coin, but there may not. Your BASIC program should allow you to input your choice of these possibilities. Then, using only three weighings on a balance scale, it should be able to determine that all the coins are indeed genuine or identify the fake and confirm that it is lighter or heavier than the others. You may place any number of coins on each side of the scale for any one weighing.

Obviously, the solution is easy if all the coins are real; the hard part is identifying a fake. Readers may recall an earlier problem (March 1984) with bags of coins. This one is much more sophisticated; if you're looking for a real programming challenge, this is your month. Hint: as a computer user, you're familiar with the binary (base 2) number system. Dr. Grossman's solution uses the ternary (base 3) system.

ASCII Numbers

Last month's problem asked for a program to find positive integers with this common property: the sum of the ASCII values of the individual digits equals the number itself. Longtime readers know that number 153 meets this qualification: ASC("1")=49, ASC("5")=53, ASC("3")=51, and 49+53+51=153.

The program shown below is relatively simple and need not search very far. (It examines only the numbers from 1 to 1000.) As the sample run shows, there are only 10 solutions: numbers 150 through 159. □

Dr. Michael W. Ecker is an associate professor in the Department of Mathematics and Computer Science at the University of Scranton.

Author's Note: I welcome comments and actively solicit new problems, with your solutions. Enclose a self-addressed, stamped envelope if you wish a reply. Address all correspondence to Dr. Michael W. Ecker, Contributing Editor, Popular Computing, 129 Carol Drive, Clarks Summit, PA 18411.

```
10 PRINT "Find all numbers less than 1000 which"
20 PRINT "equal the ASCII sum of their digits"
30 PRINT
40 PRINT "List follows:"
50 N=1
60 N=N+1
70 N$=STR$(N)
80 SU=0
90 FOR P=1 TO LEN(N$)
100 D$=MID$(N$,P,1)
110 IF D$=CHR$(32) THEN 130
120 SU=SU+ASC(D$)
130 NEXT P
140 IF SUM=N THEN PRINT N
150 IF N<1000 THEN 60
160 PRINT "End of list"
170 END
```

Solution to the ASCII numbers problem.

```
Find all numbers less than 1000 which
equal the ASCII sum of their digits

List follows:
 150
 151
 152
 153
 154
 155
 156
 157
 158
 159
End of list
```

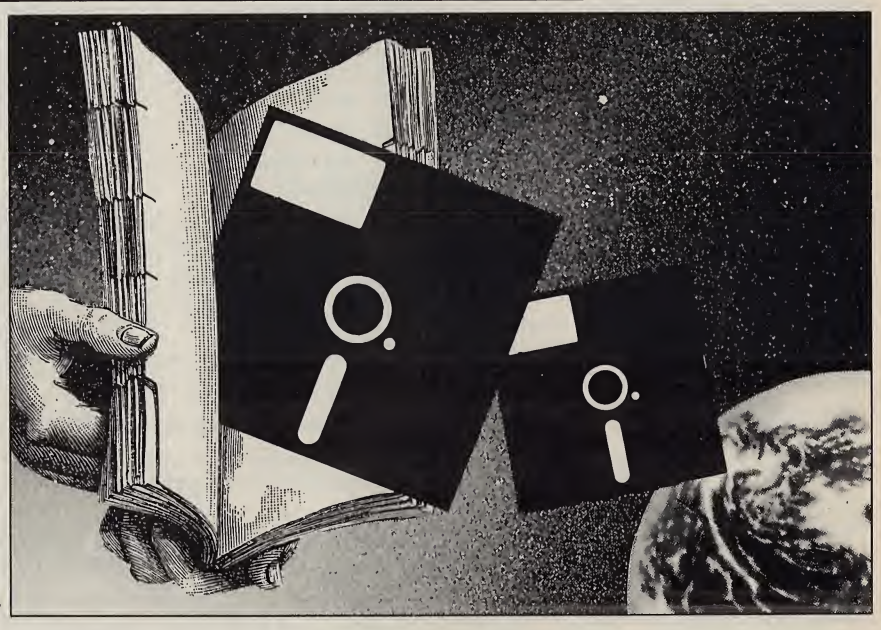
Sample run of ASCII numbers program.

He's Got the Whole Earth...

Candor, brevity, and wit distinguish Stewart Brand's latest effort

Whole Earth Software Catalog

Stewart Brand, Editor in Chief
Quantum Press/Doubleday
New York, 1984
208 pages, paper $17.50
Reviewed by Larry McClain



If publisher Stewart Brand were a moviemaker, his name would go above the title, à la "A Steven Spielberg Presentation of a Stewart Brand Film..."

The eminently quotable West Coast entrepreneur made his publishing debut back in 1968 with the *Whole Earth Catalog*, that seminal survival guide for the Woodstock Nation. During the late '70s, Brand started inching out of the backpacking-and-biodegradables market into high-tech. (Didn't we all?) Brand's *CoEvolution Quarterly* became the hatchery from which sprang the digest-sized *Whole Earth Software Review* (1983), a refreshingly quirky computer magazine that gave Brand the confidence to go fishing for a major book deal. And, oh, what a deal! Not only did Doubleday reportedly fork over a whopping $1.3 million advance for the *Whole Earth Software Catalog*, but the publisher gave it to a nonprofit foundation—Brand's Point Foundation, based in Sausalito, California. Naturally, everyone wondered if the resulting book would be up to snuff.

Well, you can forget about terms like "backlash" or "bomb" or even "noble failure." If you'll pardon my Gene Shalitesque ardor, I feel that the *Whole Earth Software Catalog* is the best wide-spectrum computer book I've read in more than two years. I'll even stick my neck out to predict that reviewers' raves and excellent word of mouth about the book will make the *Catalog* one of 1985's bestsellers.

The editorial team responsible for *WESC* reads like a veritable Who's Who in computer journalism: 11 contributors from *Dr. Dobb's Journal* (writing, of course, under the collective byline of "Dr. Dobb"), telecommunications maven Art Kleiner (formerly editor of the *Whole Earth Software Review*), and *Popular Computing* contributing editor Steven Levy, to name a few. But the sweetest hosannas will probably waft in the direction of *WESC*'s editor and research director, Barbara Robertson. The book's final paragraph even contains a Brandian salute to Robertson: "the heroic intelligence in the middle of input traffic."

The *Whole Earth Software Review* (the magazine) is without question the spiritual papa of the *Whole Earth Software Catalog*. True, the book has a slicker, more consistent look, but the *Review*'s deft blend of humor (drier than Bombay gin), its refusal to get pedantic, and its "touché, you Yuppies" sense of

Larry McClain is executive editor of *Architectural and Engineering Systems* magazine in Southern California.

Illustration by Marc Yankus

merriment were all key ingredients in the creation of the *Catalog*. Moreover, the *Review* was the first (perhaps only) computer magazine to feature teams of software reviewers, with one writer assessing the software for three or four paragraphs before politely "passing the baton" to the next writer ... and the next, until all the salient features have been discussed.

Make It Candid — and Quick!

The clarity and *brio* of the *Whole Earth Software Catalog* are a source of endless joy (especially in an era when most computer books are blazing new trails in monotony, not unlike those 24-hour weather stations on cable TV). But what really makes *WESC* unique are two things that have been in short supply since Calvin Coolidge left office: candor and brevity.

At the very outset, Stewart Brand makes it quite clear what he's trying to accomplish with the *Catalog*:

> *Those who know a software program well don't have sufficient comparative experience; at the same time the professional wide comparers don't have the deeper-use experience. The only relief from the paradox is sustained discussion, gossip and argument among the enraptured deeps and cynical wides, and that's all this book is. It came to a greater convergence of opinion than we expected.*

Brand's statement of purpose is just the first round in the Candor Sweepstakes. Toward the end of the tome, the publisher includes an extensive cash report for the period roughly one year prior to publication. Brand also flatly states that "we must sell 540,000 copies of the *Catalog* in the United States before we see any money beyond the advance."

Long before these purer-than-Pat Boone revelations were made, Brand had given Robertson the green light to select her own "domain editors" (where domain is understood to mean general topic of interest). Thus all 362 software packages scrutinized in *WESC* fall into one or more of 11 domains: Playing, Writing, Analyzing, Organizing, Accounting, Managing, Drawing, Telecommunicating (the largest of the domains at 20 pages), Programming, Learning, and, finally, Etc., a catch-all category for outstanding software that otherwise falls through the cracks.

Everyone has heard that old business bromide, "Policies filter down from the top," and, indeed, it appears that Brand's frank and forthright qualities had an effect on the domain editors. To their credit, the *Catalog*'s contributing editors did not define candor as "license to take vile potshots at 80 percent of what we're reviewing." Instead, the software tips and admonitions found in *WESC* have a disarming directness. In short, these are classy contributors who have no desire to trash software just to be ornery. They just want to spread the computing gospel, one domain at a time.

Much of the *Catalog*'s pizzazz stems from the brevity of its software mini-reviews and discussions. In just two pages within the Programming domain, the gang from *Dr. Dobb's Journal* manages to crystallize and condense a lot of important information about utility programs. Likewise, there's a sidebar entitled "Unix Compared To PC-DOS" (also in the Programming domain) that says more in 400 words than most computer scribes typically convey in 4000.

Methinks the *Catalog*'s contributors were a little too choosy in selecting packages to review, inasmuch as they tapped into only 362 of the 1900 pieces of software in Point Foundation's library. In the final tally, non-business software gets a bigger chunk of the book than does business software. For example, *WESC* offers capsule reviews of 75 Atari packages and 75 Commodore 64 packages. Meanwhile, only 69 programs for CP/M machines get *Catalog* attention. Another interesting point: 86 percent of the Atari packages fall under Drawing, Playing, or Learning. That might turn off business-oriented browsers who aren't patient enough to note that the Accounting, Managing, Organizing, and Analyzing domains offer business insights aplenty: system requirements, reviews, and short-but-sweet buyer's guides.

There's an eye-pleasing balance to the graphics and layout of the *Catalog*—not too busy, not too prosaic. The book makes a little color go a long way in such domains as Playing and Drawing. Perhaps because this venture is first and foremost a software catalog, the section entitled "Hardware" seems rather drab and lifeless. The black-and-white photos of the DEC Rainbow and the NEC APC III, for example, are about as moribund as the sales figures for those two machines!

An Instant Classic?

But don't let these minor gripes discourage you from buying the *Whole Earth Software Catalog*. Like a hit play that lights up Broadway during the bleakest part of winter, this book's special admixture of the funky and the functional could make it a runaway hit.

Yes, I'd bet the farm that the *Whole Earth Software Catalog* is going to be a huge success, and here's the clincher: Stewart Brand has a face that fits my mental picture of what Woody Allen's visage will look like in 10 years—half-craggy, half-pensive. For that reason alone, he'd be a natural on the TV talk-show circuit, especially when he uncorks a *Catalog* quote like this one:

"My theory of old age is that people decay and eventually die from having too much stuff to remember. I can't tell yet if personal computers are helping or hindering our beleaguered life-work of Keeping Track...The more the computer is remembering for you, the more you have to remember what *it's* remembering!"

Wry viewpoints like that are what make the *Whole Earth Software Catalog* a book you'll have no trouble remembering for a long, long time. □

MICRO REVIEWS

by Mike Nicita and Ron Petrusha

The Endless Apple

by Charles Rubin
Microsoft Press, Bellevue, WA, 1984, 338 pages, paper $15.95

"This book," writes Rubin, "is for Apple II lovers who are no longer completely happy with their machine's capabilities." Rubin maintains that the path to "endless" happiness is not necessarily the purchase of a new micro, but recourse to one of the hundreds of Apple II software and hardware enhancements. While other directories have listed these programs and accessories, this book is one of the first to treat enhancements on an application-specific basis. Apple II users primarily interested in word processing, for example, will find capsule summaries of the most popular software, lists of feature-packed circuit cards, and, most important, complete "showcase systems"—souped-up Apple systems with the retail prices of each special program and peripheral. Rubin's research into what combination of components works best is evident in his treatment of each of the major applications areas—spreadsheets, communications, graphics, and games. However, even he is quick to note the limitations of the Apple's 8-bit architecture. Apple users will find this honest appraisal of what new, innovative technology can do to prolong the lives of their machines to be the most important aspect of the book.

The Portable Computer Book

by James E. Balmer and Matthijs Moes
Arrays Inc., Los Angeles, 1984, 353 pages, paper $19.95

Ever since the release of the Osborne 1, portable computers have been an expanding component of the hardware market. Most previous attempts to assist the potential buyer have foundered on this rapid rate of change, as well as on their own failure to supplement microcomputer generalities with portable computer specifics. Finally, though, *The Portable Computer Book* succeeds in combining a firm grounding in microcomputer basics with a helpful buyer's guide to portable computers. Over half of the book is devoted to a wide-ranging, lively, and informative introduction to microcomputers that is tailored to the motivations of portable computer buyers. This general discussion emphasizes not only the portability of these machines but also their potential applications, their prices, and their compatibility with other machines. (The treatment of compatibility alone more than justifies the purchase of this book.) An equally outstanding buyer's guide to portables follows the overview. All portable computers available when the book went to press are described, evaluated, and rated in a standard format. For the first time, Balmer and Moes have put some sense into the bewildering process of picking a portable computer.

Heath/Zenith Z-100 User's Guide

by Hugh Kenner
Brady, Bowie, MD, 1984, 150 pages, paper $15.95

Kenner has followed a recent trend in microcomputer book publishing by writing a user's guide for the uninitiated. Whereas most traditional user's guides provide a wealth of technical detail, Kenner essentially introduces the rudiments of disk operating systems and examines possible computer applications. A brief section on software selection is followed by a hasty examination of specific applications areas: word processing (where the now archaic distinction between text editors and formatters is preserved), database management systems (only QUERY and dBASE II are examined in any detail), electronic spreadsheets (which overlooks most of the major packages), telecommunications, and graphics. Kenner also includes a perfunctory survey of computer languages. He concedes that his guide is "no substitute" for the Zenith BASIC manuals or a specialized introduction to BASIC but nonetheless goes through the motions of showing how BASIC programs are written. Other languages are also mentioned, with Kenner recommending one particular compiler/interpreter in each case. All of these superficial overviews and a pronounced machine-specific chauvinism make *Heath/Zenith Z-100 User's Guide* a book all but the most inexperienced users will gladly overlook.

Apple to IBM PC Conversion Guide

by Richard Steck
Scott, Foresman, Glenview, IL, 1985, 102 pages, paper $11.95

As blasphemous as it may sound to Apple users, this book is about overcoming the difficulties of converting from an Apple II, II Plus, or IIe to an IBM PC. Though it presents very little in the way of new techniques, Steck's book is one of the few that treats the full range of hardware and software problems involved in the transfer and conversion of programs and files. After discussing typical IBM PC configurations along with their Apple equivalents, Steck then looks at a few general techniques for converting Applesoft and Integer BASIC files to text files as a prelude to transferring them to the PC using standard communications methods (curiously, null modem data transfer is never even mentioned in the book). Finally, he covers the nuances of converting one dialect of BASIC to the other, emphasizing major differences in graphics, memory locations, and disk-file operations. While far from a

Mike Nicita and Ron Petrusha are coauthors of *The Reader's Guide to Microcomputer Books*, 2nd ed. (Golden-Lee, 1984).

definitive technical guide, this book is a good place to explore just how much data can be salvaged when switching from an Apple to an IBM system.

ComputerSpace

by James Wagenvoord
Perigee, New York, 1984, 128 pages, paper $9.95

For the habitual microcomputer user, space is not the final but the first frontier. Wagenvoord's book provides some state-of-the-art solutions to this problem—it is a guide to the creation of "efficient, expandable, distraction-free" computer environments in the home. Half of the book presents a case-study approach to the design of "ergonomic" work areas. From the "computer as appliance" school of interior design ("put it next to the toaster") to the very tasteful, coordinated "computer in the guest room," Wagenvoord's gallery of setups is filled with some very different approaches to computer work space. The second half of the book catalogues the latest in microcomputer accessories, again covering the wide range from lighting to uninterruptible power supplies. Retail prices and manufacturers are given for each product. Though the production quality of this book falls far below the high design standards it preaches, it is still an unusual sourcebook for microcomputer users to whom style can be as important as substance.

System Design Guide Featuring dBASE II

by Ron Freshman
Ashton-Tate, Culver City, CA, 1984, 183 pages, paper $18.50

This "introduction for people who would like to develop a computerized system to solve a paperwork information problem" is not, as its title implies, a guide to system design but rather an introduction to dBASE II. Writing for the beginner, Freshman goes through the motions of introducing database design, but what he has in mind more closely resembles a simple filing system. His concern is that this filing system be well planned and that it make good use of selected dBASE II features—such as the abilities to execute sequences of commands from disk files and to present the user with menu-driven options and data-entry forms. In the process, what Freshman overlooks is the power of dBASE II as a relational database management system. Although the author introduces the concept of key fields, he never brings it into the application example, which has the reader construct a sample mailing list. While *System Design Guide* could give the novice a good grounding in some of the features of dBASE II, it has little appeal either for experienced computer users or for those in search of a database management system for more sophisticated applications.

Inside Commodore DOS

by Richard Immers and Gerald G. Neufeld
Datamost, Chatsworth, CA, 1984, 508 pages, paper $19.95

Inside Commodore DOS is an exemplary nuts-and-bolts study of a particular disk operating system. After providing some essential background information on Commodore DOS and the Commodore 64/1541 disk-drive interface, the authors begin a hands-on treatment of advanced DOS features and functions. They treat direct-access programming (directly accessing the information stored on disk or within the disk drive's memory) and intermediate direct-access programming (working directly with the floppy-disk controller) before going on to applications-oriented chapters on disk protection (and copying) and "getting out of trouble"—restoring accidentally erased files, recovering data from bad sectors, and so forth. These discussions are complemented by almost 50 helpful DOS utility programs, which perform such diverse functions as copying an entire disk or recovering an individual track and sector. The end of the book explores the 1541's read-only memory, providing addresses, labels, and descriptive commentary. *Inside Commodore DOS* is an excellent exploration of the Commodore DOS and 1541 disk drive—an obligatory addition to the library of every advanced Commodore data file programmer.

An IBM Guide to Choosing Business Software

Banbury Books, Wayne, PA, 1984, 290 pages, paper $19.95

For most manufacturers, the opportunity to appear in print is simultaneously the opportunity to plug one's own product. One of the striking features of this work, which is co-published by Banbury Books and IBM, is that IBM has not opted for product promotion at the reader's expense. In fact, the book has gone overboard by failing to mention specific machines and particular software packages. Once the reader adjusts to this definite limitation, however, he or she will find a superior treatment of software selection for the business environment. While the book does mention the myriad of possible computer applications, all real attention is devoted to accounting applications. This narrow focus should not deter the computerizing business person, however. Illustrations and comprehensible text emphasize the features that good accounting software should possess, and each stage in the software selection/implementation process is examined in clear detail. There is a pronounced similarity between the IBM PC and *An IBM Guide to Choosing Business Software*: neither is especially innovative; both are simply solid pieces of craftsmanship that, whenever they do something, do it well. Despite the book's failure to provide the least semblance of a brand-name buying guide, the reader will emerge with a firm understanding of how to select business software. □

CONTINUED FROM PAGE 80

lustrator software (included with most versions at no extra charge). The program lets you create, save, and load graphics. It also features printer output and a magnifying mode that allows dot-by-dot editing.

Koala Technologies Corp., 100 Patrick Henry Dr., Santa Clara, CA 95052; $125 (but many discount houses sell the system for well under $100).

► MAGELLAN LIGHT PEN SYSTEM offers yet another innovative way of inputting information into a computer. Like Optomouse and Koalapad, this device can take the place of your computer's keyboard, making both graphics creation and menu selections fast and pleasant chores. The system is designed to work with the Apple II and IIe systems.

The light pen connects easily to the Apple's game interface, and a built-in pushbutton allows dot-by-dot graphics editing directly on the computer's video display, while also giving you maximum control over freestyle drawing operations.

Included with the pen are a pair of software packages. Quickdraw is a complete graphics-creation program that allows you to draw and edit commercial-quality graphics. Amper-Pen helps programmers incorporate light pen operations into Applesoft BASIC programs.

Magellan Computer Inc., Suite D, 4371 East 82nd St., Indianapolis, IN 46250; $190.

► RAM+6 multifunction card lets IBM PC owners add six commonly needed features while utilizing only a single expansion slot. The card includes a clock/calendar, an RS-232C serial port, a Centronics-type parallel interface, and as much as 348K bytes of additional random-access memory.

The clock/calendar eliminates the need to manually enter the date each time the computer is powered up. An on-board lithium battery enables the clock to keep accurate time even when the computer is switched off. The RS-232C port can be used to connect printers, modems, and other serial-based peripherals to the PC. The card's parallel interface is completely compatible with IBM's printer adapter. It can replace the printer port on the monochrome video display and printer adapter or take the place of the normal or alternate ports of the printer adapter.

Ram+6 comes with Flash Disk software, which effectively increases disk operation speeds by as much as 80 percent. The software also provides a printer buffer that operates with both the parallel and serial interfaces.

Seattle Computer, 1114 Industry Dr., Seattle, WA 98188; $195 without memory chips, $423 with 384K bytes.

► OMNI-READER, an optical character reader, lets you enter text documents into your computer without ever having to touch a keyboard. One of the least expensive optical character readers currently available, Omni-Reader works with Apple, IBM, Hewlett-Packard, and many other computers.

The tablet-shaped device uses a movable light-sensitive linear array to scan individual lines of text. You guide the array along a built-in ruler that incorporates a special grating system. As the array scans the text, the grating divides each line into a series of discrete signals. An internal microprocessor, which uses specially developed algorithms, interprets these signals and sends the decoded characters to its host computer. Omni-Reader is capable of recognizing an extensive variety of print styles, including decorative type fonts. You can also "teach" the system to recognize nonstandard typefaces.

Omni-Reader is especially useful for those who must input large amounts of information or who have difficulty typing.

Oberon International, Suite 630, 5525 MacArthur Blvd., Irving, TX 75038; $499.

► THE WIRE CUBE, an inexpensive surge protector and power-line filter, guards your computer and data. The unit senses and suppresses electrical surges and spikes caused by lightning strikes and other natural and man-made interference sources. The unit, which measures approximately one square inch, plugs into any standard electrical outlet and is small enough for portable-computer owners to take along on trips. It provides valuable insurance at a relatively low cost.

Networx, 203 Harrison Pl., Brooklyn, NY 11237; $40.

► HARD-DISK proves that a hard-disk data storage system doesn't have to break a computer owner's budget. At $1295, Hard-Disk isn't dirt cheap, but this quality 5-megabyte removable disk unit should provide reliable mass storage for many years. Versions are available for the Apple II and IIe and IBM PC.

In its Apple configuration, the drive is compatible with Apple DOS 3.3, CP/M, and Pascal. The IBM rendition provides the same I/O bus interface as the IBM PC XT and supports all PC disk commands plus extensions. An optional interface board allows the IBM version or a Winchester-type system to operate on an Apple II or vice versa. The system is shipped with a two-drive controller that is capable of handling any combination of removable or fixed disk drives.

Digital Electronic Systems Inc., Estill Springs, TN 37330; $1295, optional interface board $149.

► CHIP-TOTE is a carrying case for the TRS-80 Model 100, NEC PC-8201, and Epson HX-20 that also doubles as a portable desk.

The case features a slim, foam-padded design that opens up into a convenient, one-piece workstation (the computer never has to be removed from the bag). The case's stand-up utility top holds papers upright for easy reference while inner pockets keep books and notepads handy. A zippered pouch holds an acoustic modem coupler, cables, an AC adapter, extra batteries, and other accessories. Chip-Tote is constructed of DuPont Cordura nylon and is available in smoke gray or black.

Kangaroo Video Products Inc., Suite C, 10845 Wheatlands Ave., Santee, CA 92071; $60. □

CONTINUED FROM PAGE 84

puter Update, and many other benefits. Contact: The Boston Computer Society, One Center Plaza, Boston, MA 02108; (617) 367-8080 (9:30 a.m. to 5:30 p.m., EST).

Free Software Over the Phone

If your computer is equipped for communications, you can also obtain free software over the telephone. There are two main types of on-line sources: privately owned and operated computer bulletin board systems (BBSes) and commercial utilities like Compuserve and The Source.

Most BBSes provide on-line instructions once you make the connection, and there are lots of places to get BBS phone numbers. You should start with members of your user's group. But if that's not possible, one of the best printed sources is *The On-Line Computer Telephone Directory* (OLCTD) published by Jim Cambron. Each number on the list is verified by Cambron before a new issue goes to press. The cost is $9.95 a year (four issues). Contact: OLCTD, POB 10005, Kansas City, MO 64111-9990.

The Apple City and Source Apple User's Group (SAUG) sections of User Publishing on The Source also have some wonderful free software. And there are free programs for other computers tucked away in little nooks and crannies. But large quantities of free software have yet to appear on The Source, and if the free stuff is your main interest, Compuserve is definitely the information utility you should choose.

The Compuserve Starter Kit, now available in most book and computer stores (or write: Compuserve Information Service, 5000 Arlington Center Blvd., Columbus, OH 43220), contains the manual, account number, password, and everything else you need. The cost is $39.95 and includes five free hours on the system.

While free software is to be had in the ACCESS file-sharing feature of Compuserve (which you get to by typing GO PCS-46 at the prompt), the major collections are in the Special Interest Groups or SIGs. These can best be thought of as electronic user's groups. There's at least one for every major brand of computer, and only a very few charge membership fees. You can learn more about SIGs on-line, but an easier (and perhaps cheaper alternative) is to send for a copy of the *Special Interest Groups and Clubs* manual from Compuserve. The cost is $4 and it can be ordered by GO-ing to the FEEdback section while you're on-line.

Comparing the Costs

Computer bulletin boards are free, but long-distance telephone calls to reach them decidedly aren't. Compuserve is not terribly expensive ($6 to $12.50 an hour after 6:00 p.m., your local time), but it's far from free.

At 300 bits per second, for example, a 64K program requires over half an hour to transmit and costs around $3.20 at Compuserve's lowest nighttime rate. When you consider that a single public-domain disk obtained from a user's group containing three to five times that amount of programming can be had for about $6, the economics favor the user's group option.

But still, whether you obtain the software by phone or on disk, the costs are phenomenally less than commercial programs. For example, let's examine the costs of "productivity software"—programs such as word processors, database programs, and communications software. Here's what you can save if you own an IBM PC, PCjr, or compatible:

Program	Cost of Commercial Counterpart
PC-WRITE (word processing)	$495
PC-CALC (electronic spreadsheet)	$250
PC-FILE (database management)	$250
PC-TALK (telecommunications)	$195
Total Cost: $175	$1190

Each of these programs is offered as user-supported software. Their authors request a contribution from those who find their program to be of value. And you will, since all four are really super. The total of the voluntary contributions comes to $175, leaving you with a clear conscience and a clear savings of $1015.

The savings for other machines will not be quite as dramatic. But with very few exceptions, you will be able to fill 50 percent or more of your productivity software needs from public-domain collections for your computer. You may not save thousands, but you'll certainly save hundreds of dollars.

Clearly, free software cannot be all things to all people. But I have no hesitation in saying that everyone will find something worthwhile in the public domain. The utilities alone will save you countless hours and untold frustration. But it goes beyond that and beyond substituting PD software for commercial products.

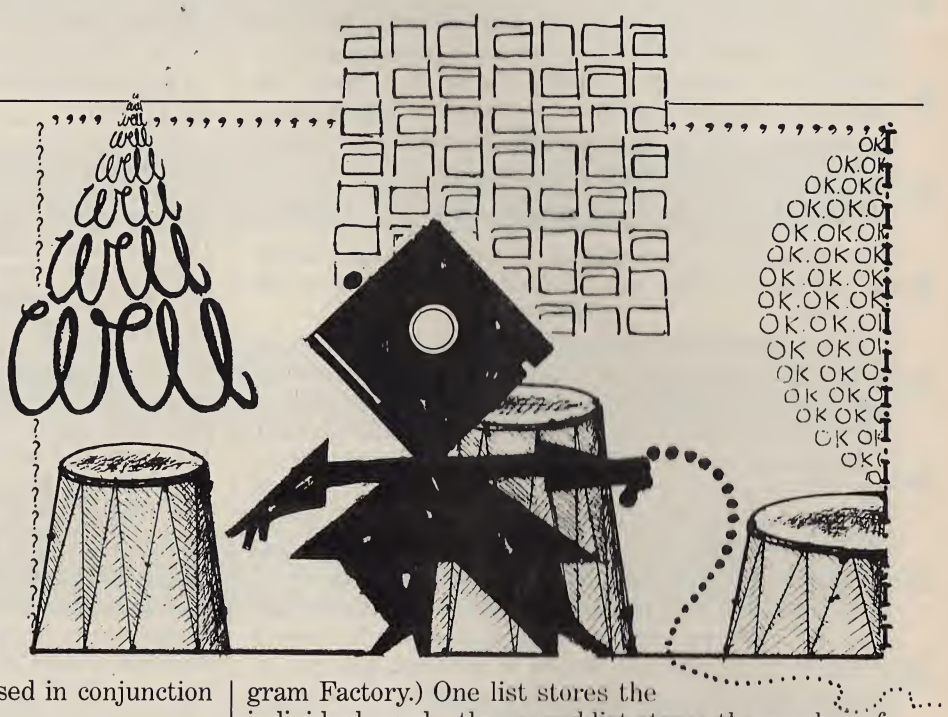
For example, if you already own a popular program like dBASE II, Visicalc, or Lotus's 1-2-3, you'll find command files and templates to help you get more out of them. If you're on the fence about buying a particular type of commercial software, the public domain offers a risk-free way to try that type of software. Even if the PD program turns out not to have all the power you need, at the very least it will give you a better feel for what that type of software can do and the features likely to be most important to you in a commercial product.

If you're interested in learning to program, the public domain can be a teacher without parallel. Virtually all PD programs are listable, making it easy for you to follow the thinking of their creators and learn from their mistakes and solutions. Before long, you'll be enhancing programs with whistles and bells of your own, perhaps contributing the result to the public domain so that others may benefit from your work.

Finally, whether you're young or old, a novice or an experienced hand, free software is just plain fun. Each disk or cassette is a surprise package, and the supply is virtually limitless. You never know what you're going to find. But you can always count on free software to help you get more out of your computer—for less—than you ever dreamed possible. □

Text Scanner II

Analyze the vocabulary of documents with this BASIC program



by George Stewart

Last July we presented a program to count the number of words and sentences in a document and compute the average word and sentence length. This month's program, Text Scanner II, provides another versatile measure for analyzing text: it counts the number of times different words occur in a document and prints a list of the words in descending order of frequency.

Text Scanner II can help you spot repetitive words in your writing. You might also use the program to catalog a document or article by preparing a list of its key words. Teachers might find the program helpful for compiling a vocabulary list to be used in conjunction with a reading assignment.

How the Program Works

Text Scanner II has two major components: a word finder and a word filer. The word finder roughly follows the logic of the previous text-scanner program (July 1984, page 199). Briefly, this part of the program reads text one line at a time from the keyboard or from a disk file and examines the line one character at a time. To find words, the program searches for characters that mark the beginning and end of words. Only a letter can mark the beginning of a word, and only a delimiter can mark the end. The program treats any character that is not a letter, hyphen, or apostrophe as a delimiter. Consequently, "didn't" and "red-hot" are considered single words. The program does not include numbers in the word count.

The word filer keeps track of the vocabulary in two linked lists. (In a linked list, each entry contains a pointer that indicates the next entry in the list; for a full explanation of linked lists, see page 182 in last month's Program Factory.) One list stores the individual words; the second list stores the number of times each word is used. When the program finds a new word, it creates a "word card" and places the card in a "folder" labeled frequency #1. When the program finds a word that has already been used, it locates the word card and moves it into the folder labeled with the next higher frequency. Word cards are stored alphabetically within each frequency folder.

The BASIC Program

Text Scanner II is written in Microsoft BASIC and should run without any modification on most personal computers. Where language differences might cause problems (mainly in the disk-input routines), we offer alternate lines for various computers. Type these lines in only if you cannot use the primary lines, and look up unfamiliar BASIC words in your reference manual.

We present the program in logical blocks. The first block sets up certain constants:

George Stewart is a contributing editor of *Popular Computing*.

Illustration by Maciek Albrecht

```
10 CLEAR 9000
20 LET XW=255
30 LET XL=255
40 LET YES=1
50 LET NO=0
60 LET CR$=CHR$(13)+CHR$(10)
70 LET NU$="": REM No spaces in quotes
80 REM
90 REM
100 INPUT "Enter estimated vocabulary
      size ";MW
110 IF MW<1 THEN 100
120 LET MF=MW
```

Line 10 reserves 9000 bytes of memory, which is enough to store 1700 different words. (If you have Applesoft or Commodore BASIC, omit this line.) The number of bytes cleared is proportional to the estimated vocabulary size of a document. To calculate storage space, use this formula:

CLEAR amount = vocabulary size × 5 + 500

For instance, if you expect a document to have about 400 different words, use CLEAR 2500 (400 × 5 + 500 = 2500).

To estimate the vocabulary size of the document, figure that the maximum vocabulary is 90 percent of the total word count. For instance, if the document contains around 1000 words, estimate the vocabulary at 900.

In lines 20 and 30, XW is the longest allowable word and XL is the longest allowable line of text. Line 60 stores a carriage return and line feed in CR$, which starts a new line on the display. Line 100 prompts you to type in the estimated vocabulary size MW.

In line 120 MF is the maximum number of frequencies. MF=MW handles the unlikely case in which every word in the document occurs a different number of times. Ordinarily, you can set MF equal to a fraction of MW, as in MF=INT(MW*.8)+50. In most cases, .4 or .5 will suffice.

The next block of lines sets up the linked list structures:

```
130 PRINT "Setting up the filing
      system..."
140 DIM F%(MF), FL%(MF), FW%(MF),
      W$(MW), WL%(MW)
150 FOR AF=1 TO MF-1
160 LET FL%(AF)=AF+1
170 NEXT AF
180 LET FL%(MF)=0
190 LET AF=1
200 FOR AW=1 TO MW-1
210 LET WL%(AW)=AW+1
220 NEXT AW
230 LET WL%(MW)=0
240 LET AW=1
250 LET KF=0
260 LET KW=0
270 LET SF=0
280 LET WC=0
```

In line 140 F%( ) stores the frequency assignments for the folders; F%(I)=1, for example, indicates that folder I contains words occurring once. FL%( ) stores the links to succeeding folders. FW%( ) points to the first word card in a folder. W$( ) stores the words. WL%( ) stores the pointers to the next word in a folder. The % symbols indicate integer arrays, used instead of ordinary floating-point arrays to conserve memory and speed program operation. If your computer doesn't have integer arrays, omit the % signs throughout the program.

In lines 250 and 260, KF and KW keep track of the number of frequency folders and word cards used. SF points to the first folder; SF=0 indicates no folders are in use. WC is the total word count.

The following block controls the process of finding and filing words:

```
290 INPUT "Enter text from: 1-Keyboard
      2-Disk ";SI
300 IF SI<1 OR SI>2 THEN 290
310 IF SI=1 THEN 370
320 FILES: REM List disk files
330 LET FI$=NU$
340 LINE INPUT "Name the input file
      ";FI$
350 IF FI$=NU$ THEN 290
360 OPEN "I",1,FI$
370 LET CP=0
380 LET LI$=NU$
390 LET EF=NO
400 GOSUB 500: REM Analyze text
```

Line 290 asks you to specify the source of the input text as keyboard or disk. Line 320 lists the disk files stored on the computer's primary disk drive. For other versions of BASIC, you may need a different command; for some TRS-80s, for example, use SYSTEM "DIR".

If you don't have standard Microsoft BASIC, you must modify the disk-input routines. (We offer alternate lines for Applesoft and Commodore BASIC at the end of this article.) In this case, it's a good idea to omit the disk-input function until you have the program working with keyboard input. To eliminate the disk option, type in these lines:

```
320 PRINT "Disk option not available
      yet."
330 GOTO 290
```

The next block of lines concludes the main program listing:

```
410 PRINT CR$; "Found ";KW;" distinct
      words out of a total of ";WC;"
      words."
420 PRINT CR$; "1-List words by
      frequency"
430 PRINT "2-Search for a single word"
440 PRINT "3-End"
```

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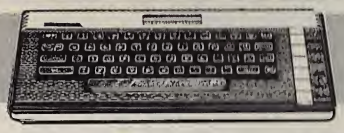

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```
450 INPUT "Select 1-3";CH
460 IF CH=3 THEN END
470 IF CH<1 OR CH>2 THEN 420
480 ON CH GOSUB 1100,1210
490 GOTO 420
```

These lines print a continuation menu with options to list words in order of frequency, search for a word and print its frequency, and end the program.

Program Subroutines

The first subroutine performs the text analysis:

```
500 LET ET=NO
510 LET OK=YES
520 GOSUB 610
530 IF ET=NO AND OK=YES THEN 520
540 IF OK=YES THEN 590
550 PRINT "Document analysis is
      incomplete due to stated error."
560 IF ET=YES THEN 590
570 CLOSE 1
580 RETURN
590 PRINT "Reached end of text"
600 RETURN
```

The subroutine called in line 520 gets the next word. When ET (end-of-text indicator) equals YES, the end of text has been reached. When OK (file-status indicator) equals NO, no more words can be filed.

Here's the subroutine that locates the next word:

```
610 LET EW=NO
620 LET IW=NO
630 LET CW$=NU$
640 GOSUB 810
650 IF C$<>NU$ THEN 680
660 LET ET=YES
670 GOTO 720
680 IF C$<"A" OR C$>"Z" THEN 710
690 LET IW=YES
700 GOTO 740
710 IF (C$="-" OR C$="'") AND IW=YES
      THEN 740
720 IF IW=YES THEN LET EW=YES
730 GOTO 760
740 LET CW$=CW$+C$
750 IF LEN(CW$)=XW THEN LET EW=YES
760 IF EW=NO AND ET=NO THEN 640
770 IF EW=NO THEN RETURN
780 GOSUB 1320
790 IF OK=YES THEN LET WC=WC+1
800 RETURN
```

The subroutine called in line 640 gets a character C$ from the most recently input line of text. When C$ equals NU$ (the null or empty string), the end of text has been reached. The subroutine called in line 780 files the word CW$.

The following subroutine takes C$ from the text:

```
810 IF CP=LEN(LI$) THEN 870
820 LET CP=CP+1
830 LET C$=MID$(LI$,CP,1)
840 IF C$>="a" AND C$<="z" THEN LET
      C$=CHR$(ASC(C$)-32)
850 REM
860 RETURN
870 IF EF=NO THEN 900
880 LET C$=NU$
890 RETURN
900 IF LEN(LI$)=XL THEN 940
910 LET C$=CR$
920 GOSUB 970
930 RETURN
940 GOSUB 970
950 GOSUB 810
960 RETURN
```

Line 840 converts lowercase to uppercase letters so the word filer will recognize duplicate words regardless of capitalization in the original text.

The next program block gets a line from the keyboard or disk:

```
970 LET LI$=NU$
980 LET CP=0
990 ON SI GOTO 1000,1040
1000 PRINT CR$; "Enter text (empty line
       to quit):"
1010 LINE INPUT LI$
1020 IF LI$=NU$ THEN LET EF=YES
1030 RETURN
1040 IF NOT EOF(1) THEN 1080
1050 CLOSE 1
1060 LET EF=YES
1070 RETURN
1080 LINE INPUT #1, LI$
1090 RETURN
```

With the keyboard-input option, you type an empty line to signify the end of text (line 1020). For Applesoft, Commodore, and other versions of BASIC that don't have LINE INPUT, make these changes to the keyboard-input lines:

```
1000 PRINT CR$;"Type a quote, then enter
       text"
1005 PRINT "(type an empty line to
       quit)"
1010 INPUT LI$
```

Lines 1040 to 1090 input a line from a disk file, following standard Microsoft BASIC syntax; for Applesoft and Commodore BASIC, refer to the end of this article for alternate lines.

These following lines list words in order of frequency (option 1 on the menu):

```
1100 PRINT "List words by frequency:"
1110 IF SF=0 THEN 1190
1120 LET CF=SF
1130 LET CW=FW%(CF)
```

```
1140 PRINT W$(CW),F%(CF)
1150 LET CW=WL%(CW)
1160 IF CW>0 THEN 1140
1170 LET CF=FL%(CF)
1180 IF CF>0 THEN 1130
1190 PRINT "End of list."
1200 RETURN
```

The next block looks for a specific word in the vocabulary list and prints its frequency (option 2):

```
1210 PRINT "Search for a word:"
1220 LET CW$=NU$
1230 PRINT "Enter the word"
1240 INPUT "(type an empty line to
      cancel) ";CW$
1250 IF CW$=NU$ THEN RETURN
1260 GOSUB 1490:
1270 IF OK=NO THEN 1300
1280 PRINT "Used ";F%(CF);" time(s) in
      the text."
1290 GOTO 1220
1300 PRINT "Not used in the text."
1310 GOTO 1220
```

To exit from this option, enter an empty line when the program asks for the next search word.

Here's the subroutine that controls the word-filing process:

```
1320 GOSUB 1490:
1330 IF OK=NO THEN 1360
1340 GOSUB 1660:
1350 GOTO 1380
1360 GOSUB 1810:
1370 IF OK=NO THEN 1470
1380 GOSUB 1930:
1390 IF OK=YES THEN 1420
1400 GOSUB 2040:
1410 IF OK=NO THEN 1450
1420 GOSUB 2200:
1430 PRINT "*";
1440 RETURN
1450 PRINT CR$; "Exceeded maximum
      expected number of distinct
      frequencies"
1460 RETURN
1470 PRINT CR$; "Exceeded maximum
      vocabulary size."
1480 RETURN
```

On entry to this subroutine, CW$ contains the word to be filed. If the word is filed successfully, line 1430 prints an asterisk on the screen. Otherwise, lines 1450 to 1480 print an appropriate error message.

The next block of lines searches for a word:

```
1490 LET OK=NO
1500 LET CF=SF
1510 LET PF=0
1520 IF CF=0 THEN RETURN
1530 LET CW=FW%(CF)
1540 LET PW=0
1550 IF CW=0 THEN 1630
1560 IF W$(CW)<>CW$ THEN 1590
1570 LET OK=YES
1580 RETURN
1590 IF W$(CW)>CW$ THEN 1630
1600 LET PW=CW
1610 LET CW=WL%(CW)
1620 GOTO 1550
1630 LET PF=CF
1640 LET CF=FL%(CF)
1650 GOTO 1520
```

On entry to this subroutine, CW$ is the word to be found. On return from the subroutine, OK indicates whether the word was found. If OK=YES, CW points to its word card and CF points to its frequency folder.

These lines remove a word card from a frequency folder:

```
1660 LET FQ=F%(CF)+1
1670 IF PW<>0 THEN 1700
1680 LET FW%(CF)=WL%(CW)
1690 GOTO 1710
1700 LET WL%(PW)=WL%(CW)
1710 IF FW%(CF)<>0 THEN RETURN
1720 IF CF<>SF THEN 1750
1730 LET SF=FL%(CF)
1740 GOTO 1760
1750 LET FL%(PF)=FL%(CF)
1760 LET FL%(CF)=AF
1770 LET AF=CF
1780 LET KF=KF-1
1790 LET F%(CF)=0
1800 RETURN
```

The next block of lines adds a new word to the vocabulary list:

```
1810 IF AW>0 THEN 1840
1820 LET OK=NO
1830 RETURN
1840 LET OK=YES
1850 LET SW=AW
1860 LET AW=WL%(AW)
1870 LET KW=KW+1
1880 LET W$(SW)=CW$
1890 LET CW=SW
1900 LET FQ=1
1910 LET WL%(CW)=0
1920 RETURN
```

If AW=0 in line 1810, no more word cards are available and the subroutine ends. Otherwise, lines 1840 to 1920 store CW$ on the first available word card and set the frequency FQ to 1.

Given a frequency FQ, the following subroutine searches for the appropriate folder:

```
1930 LET OK=NO
1940 LET CF=SF
1950 LET PF=0
```

```
1960 IF CF=0 THEN RETURN
1970 IF F%(CF)<>FQ THEN 2000
1980 LET OK=YES
1990 RETURN
2000 IF F%(CF)<FQ THEN RETURN
2010 LET PF=CF
2020 LET CF=FL%(CF)
2030 GOTO 1960
```

Upon return from this subroutine, if OK=YES, the folder was found and CF points to the folder. Otherwise, PF and CF point to the folders that precede and follow the missing folder.

If the folder is not found, these lines create one:

```
2040 IF AF>0 THEN 2070
2050 LET OK=NO
2060 RETURN
2070 LET OK=YES
2080 LET SQ=AF
2090 LET AF=FL%(AF)
2100 LET KF=KF+1
2110 LET F%(SQ)=FQ
2120 LET FL%(SQ)=CF
2130 LET FW%(SQ)=0
2140 LET CF=SQ
2150 IF PF>0 THEN 2180
2160 LET SF=CF
2170 RETURN
2180 LET FL%(PF)=CF
2190 RETURN
```

The following subroutine places the word CW$ into the appropriate folder FQ:

```
2200 LET SW=CW
2210 LET CW=FW%(CF)
2220 LET PW=0
2230 IF CW=0 THEN 2280
2240 IF W$(SW)<W$(CW) THEN 2280
2250 LET PW=CW
2260 LET CW=WL%(CW)
2270 GOTO 2230
2280 IF PW>0 THEN 2310
2290 LET FW%(CF)=SW
2300 GOTO 2320
2310 LET WL%(PW)=SW
2320 LET WL%(SW)=CW
2330 LET CW=SW
2340 RETURN
```

Running the Program

Before trying disk input, check that the program works with keyboard input, producing results similar to those shown in the sample run at right.

The program works properly only with text files stored on disk in ASCII format. Some word-processing programs, such as Wordstar, store files in non-ASCII format. Check the manuals of these programs for a way to save text in ASCII-format files.

As the size of a document increases, the longer the program takes to analyze it. For instance, on a TRS-80 Model II, analyzing a 122-word document with a 75-word vocabulary took about 3 minutes. In contrast, analyzing a 1243-word document with a 43-word vocabulary took about 1 hour, 12 minutes. If you let the program run unattended while it analyzes long documents, first test it with a short disk file. Then try it out with a longer file and check on the progress periodically.

One way to speed up the program is to eliminate short words from consideration. For instance, to ignore words shorter than five letters, add this line:

```
775 IF LEN(CW$)<5 THEN RETURN
```

Disk Input for Applesoft and Commodore BASIC

Before reading text from a disk file for Applesoft and Commodore BASIC, you must use a word-processing program to insert an end-of-file marker at the end of the last line in the text file. As an end-of-file marker, select a character that will not be used in any document; "&" is usually a safe choice.

In Applesoft BASIC, make these changes:

```
Enter estimated vocabulary size ? 20
Setting up the filing system...
Enter text from: 1-Keyboard 2-Disk ? 1

Enter text (empty line to quit):
THE RED TRUCK
**
Enter text (empty line to quit):
IS THE BEST TRUCK
****
Enter text (empty line to quit):
IN THE TOWN.
****
Enter text (empty line to quit):

Reached end of text

Found  7  distinct words out
  of a total of  10  words.

1-List words by frequency
2-Search for a single word
3-End
Select 1-3? 1
List words by frequency:
THE              3
TRUCK            2
BEST             1
IN               1
IS               1
RED              1
TOWN             1
End of list.

1-List words by frequency
2-Search for a single word
3-End
Select 1-3? 3
```

Sample run of Text Scanner II.

```
320 LET FI$=NU$
330 REM
340 INPUT "Name the input file ";FI$
350 IF FI$=NU$ THEN 290
360 OPEN 1, 8, 2, FI$ + ",SEQ,READ"
1040 GET#1, C1$
1042 IF C1$<>"&" THEN 1080: REM "&" is
      the end-of-file character
1050 CLOSE 1
1060 LET EF=YES
1070 RETURN
1080 IF C1$=CR$ THEN RETURN
1082 LI$=LI$+C1$
1084 IF LEN(LI$)<XL THEN 1040
1090 RETURN
```

In Commodore BASIC, make these changes:

```
320 PRINT CHR$(4);"CATALOG"
330 LET FI$=NU$
340 INPUT "Name the input file ";FI$
350 IF FI$=NU$ THEN 290
360 PRINT CHR$(4);"READ ";FI$
1040 GET C1$
1042 IF C1$<>"&" THEN 1080: REM "&" is
      the end-of-file character
1050 PRINT CHR$(4);"CLOSE ";FI$
1060 LET EF=YES
1070 RETURN
1080 IF C1$=CR$ THEN RETURN
1082 LI$=LI$+C1$
1084 IF LEN(LI$)<XL THEN 1040
1090 RETURN
```

If you have other versions of BASIC, check your computer's reference manual for instructions on disk-input routines. □

Author's Note: For the disk-input routine to work properly in "Hidden Words II" (December 1984), delete lines 780, 790, 800, 810, and 820 on page 216.

Do you have questions about this program or suggestions for future projects? Send them to: George Stewart, The Program Factory, POB 137, Hancock, NH 03449. Enclose a self-addressed, stamped envelope if you want a reply. For programming questions, include a program listing, sample run, and brief description of your problem.

Editor's Note: George Stewart's book, *The Apple Program Factory* (Osborne/McGraw-Hill, 1984, $11.95) is a collection of 20 programming projects, most of which have appeared here. The programs use features like graphics, disk files, and sound. A Commodore 64 version of the book is also available.

Inquiry 2

Inquiry 49

Inquiry 22

Inquiry 7

Inquiry 73

Inquiry 70

Inquiry 48

ASK POPULAR

I have a Commodore 64 and want to learn machine language. How do I find the necessary information?

Bart Crowe
Cisco, GA

Machine language is more involved than BASIC because it requires an understanding of your computer's microprocessor. Several teaching systems offer a structured learning approach.

The Visible Computer: 6502 from Software Masters (Suite BB, 3330 Hillcroft, Houston, TX 77057; (713) 266-5771), is a combination of text and software that presents an animated simulation of the Commodore's 6502 microprocessor to show how this chip functions. A 150-page manual describes the machine-language instructions, and 30 demonstration programs cover everything from simple register loads to advanced graphics programs. *The Visible Computer: 6502* sells for $39.95 plus $2.50 postage and handling.

Develop-64 4.0 from French Silk (POB 7426, Minneapolis, MN 55407; (800) 328-0145, $69.95 plus $3 postage and handling) helps you develop programming skills and obtain a full understanding of your computer's operation. It features a tutorial with a complete set of development tools, including an assembler, coresident full-screen editor, debugger, and decoder. Also included is a book, *Inside the Commodore 64*.

Once you have learned the fundamentals of machine-language programming, you can avail yourself of the many books and publications featuring programs and utility routines. Several "cookbooks" offer routines that you can incorporate into your own programs. One such book is *Compute!'s Machine Language Routines for the Commodore 64*, available from Compute! Books (POB 5406, Greensboro, NC 27403; (800) 334-0868) for $14.95 plus $2 postage and handling.

Please explain how the minuscule currents in a microprocessor can control such devices as printers and disk drives.

Dan Levinson
Tucson, AZ

Simply put, it's the same principle as using your car's ignition switch to operate the starter. A microprocessor generates small currents, but they are large enough to operate transistors and integrated circuits.

Typically, micoprocessors send and receive low-current signals that are approximately 5 volts for a logic "1" and 0 volts for a logic "0." Eight of these binary bits form a byte, which is simply a combination of the 5-volt and 0-volt signals at various pins of the output port. These voltages turn transistors or integrated circuits on and off, and these devices, in turn, can handle enough current to operate the switches in your printer and disk drive.

With a suitable interface, these data signals can be used to control anything from the lights in your house to a satellite TV antenna in your backyard.

I was quite interested in A. Richard Immel's September 1984 article, "Evaluating Software." Can you give me the address of the International Bureau of Software Test (IBST) so that I may obtain more information?

Julia Slowik
Chicago, IL

The IBST currently has two locations. The Western Lab is located at Suite 7, 536 Weddell Dr., Sunnyvale, CA 94089, (408) 745-1237, and the Eastern Lab at 165 Forest St., Marlboro, MA 01752, (617) 485-7320.

In this column in August 1984, you said it is not a good idea to connect an IBM monochrome monitor to the color/graphics board. This statement was made in response to a question regarding color and graphics programs run with this configuration.

In the course of my work, I communicate with a variety of microcomputer owners and I know that many of them use a monochrome monitor and color/graphics board. I also know that this may cause problems with the display of certain software packages.

Please explain why this is not a recommended procedure.

Vicki Tiers
Lowell, MA

The images on a video monitor are "painted" by an electron beam that sweeps across and down the screen. Horizontal and vertical synchronizing signals, included with the video information, control the painting rate.

The IBM monochrome monitor operates at a rate of 18,432 cycles per second (hertz) and paints a new screen every 1/50 of a second. The color/graphics monitor operates at 15,750 hertz and paints the screen in 1/60 of a second. These numbers simply mean that the two units are not compatible.

Plugging the monochrome monitor into the color/graphics adapter board won't work unless you add a separate jumper wire, because the board does not present a video signal at that plug. Even if this connection is made, the monochrome monitor's electron beam will be sweeping at a slower speed than its internal components normally allow, generating additional heat. This heat may cause the insulation of the monitor's high-voltage transformer to melt and result in a failure.

What is ProDOS? What are the differences between Apple DOS 3.3 and ProDOS, and how can I get ProDOS for my Apple IIe?

Oliver Noble
Pleasantville, NY

ProDOS, a contraction of Professional Disk Operating System, is Apple Computer Inc.'s new disk

Ask Popular is a monthly column conducted by contributing editors Harv Weiner and Steve Ciarcia to answer general questions about small computers. Send your questions to: Ask Popular, POB 397, Hancock, NH 03449.

operating system for the Apple II Plus, IIe, and IIc computers. ProDOS, designed to be upwardly compatible with DOS 3.3, offers many improvements. These include faster file reading and an improved file-directory structure, suitable for hard disks, that will easily handle files of up to 16 megabytes. Its file formats are also compatible with the Apple III SOS operating system formats, which means that Apple III disks will run on an Apple II using ProDOS and vice versa.

You may recall that the upgrade from Apple DOS 3.2 to DOS 3.3 required a change of ROMs on the disk controller card and disk drive. No hardware changes are required to implement ProDOS on any Apple system.

Many of the commands in ProDOS are similar to those of DOS 3.3, but the internal workings are considerably different. For example, the CATALOG command in DOS 3.3 has been replaced by two commands: CATALOG for an 80-column catalog and CAT for a 40-column catalog. Other commands such as INIT, INT, FP, MON, NOMON, and MAXFILES have been eliminated from the ProDOS BASIC system. They are either not needed or handled differently.

A more sophisticated memory manager is included in ProDOS, and many DOS 3.3 memory locations (PEEKs and POKEs) have been relocated. More file types are supported and many features are included for use with a hard disk such as Apple's ProFile. Utilities are also included to convert DOS 3.3 files into the ProDOS format, although two disk drives are required.

ProDOS is available from any Apple dealer for $36 and comes with a system disk and user's manual.

I would like to know which color monitor works best with a TI 99/4 computer. Does the Texas Instruments computer work with an RBG-type monitor?
Don M. Chamberlin, III
Farmington Hills, MI

The TI 99/4 is designed for a composite video output and will not work with RGB monitors. A look at some of the characteristics of color monitors will help answer your question.

The programs on color television are produced by a composite video signal. This is an electrical signal that contains all video information, plus the horizontal and vertical synchronizing pulses to display the image on the screen. Since television channels are 6 megahertz (MHz) apart, the video bandwidth is restricted and is typically 3.58 MHz. This is a standard composite video signal as defined by the National Television Systems Committee (NTSC) and is very close to the signal used in your computer. This bandwidth limitation restricts the resolution (the number of horizontal "dots" or pixels, displayed) to about 40 characters or approximately 300 pixels per line.

In choosing a composite color monitor, you should certainly look for the greatest bandwidth (typically about 4 MHz) and the greatest number of line pixels (typically about 300). Also consider a nonglare screen, screen size, and styling. Displaying the same program on different monitors gives a good comparison. As with stereo systems, monitor quality and resolution are not entirely in the specifications; your subjective opinion plays a great part.

I changed my Commodore 64 display from a TV set to a monochrome monitor, and the characters on the screen wave as if they were blowing in a gentle breeze. I used a five-prong cable harness with four RCA plugs at the end, and plugged the white plug, designated composite video, into the monitor. What could be wrong?
H. G. Womack
Ipswich, MA

The symptom you describe is classic 60-hertz power-line interference, most probably caused by an inadequate ground conductor in your cable. The cable, instead of shielding this interference, is acting as an antenna to capture it. See if your cable has a ground conductor and be sure that it is connected. If not, replace the cable.

Another possible source of interference is the power transformer in the Commodore 64 line cord. Its position may have been acceptable with the TV set, but it may now be introducing interference to your monitor. Try locating the computer farther from the monitor to see if it reduces the waviness.

Can you tell me the difference between sprites and shape tables?
Scott Bartley
Fishersville, VA

A shape table, as used with an Apple II computer, is a group of plotting vectors (lines) stored in memory. A shape or object is defined from the keyboard by a series of equal-length lines that can be directed up, down, left, or right. This shape can then be placed anywhere on a high-resolution graphics screen and manipulated as required with a single command. For example, the shape can be scaled, rotated, or drawn and erased to simulate motion. Shape tables are frequently used for animation.

A sprite is a graphics object of a specified pattern and is usually defined by a grid of picture elements (pixels). A coordinate pair defines the position of the sprite on the screen, and a plane position defines relative screen depth. Each plane has a priority, so that if two objects are moving toward each other on the screen, the sprite with the higher priority will seem to pass in front of the other.

Sprites simplify the programming of complex graphics displays because each sprite can have a different color and a different relative screen depth. In addition, each sprite can be directed independently. It is not necessary to erase and redraw for motion. A continuous change of an address pointer moves the sprite smoothly across the screen.

Sprite graphics is not available on every computer because special hardware is required. Computers with sprite graphics include the Commodore 64, Atari 800XL, and Texas Instruments 99/4A. □

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1	24	**Micro Journal**	Levy
2	36	**Small-Business Computing**	Immel
3	43	**Advanced Technology**	McClure
4	46	**Educational Computing**	Watt
5	53	**The Micro Revolution**	Pournelle
6	60	**The Rising Star of Epson**	Sacks
7	70	**Best Buys in Computers**	McMillan
8	76	**Low-Cost Peripherals**	Edwards
9	82	**Free Software**	Glossbrenner
10	86	**Gödel's Doom**	Zebrowski
11	94	**Computers Search for Real E.T.s**	Rothenberg
12	104	**The Apple IIc**	Sacks
13	108	**The Sanyo MBC-555**	Geary
14	113	**Video Show Hones Your Image**	Powell
15	117	**Texas Instruments Pro-Lite**	Miller
16	137	**PC-Write**	Sassano
17	143	**File Express**	Liswood
18	147	**Freecalc**	Goley
19	152	**Appleworks**	Sacks
20	158	**Thor**	Kaplan
21	160	**Homer**	Owens
22	165	**Seastalker**	Schulz
23	173	**Recreational Computing**	Ecker
24	181	**The Program Factory**	Stewart
25	189	**Ask Popular**	Ciarcia, Weiner

READER SERVICE

Inquiry		Page
1	AB COMPUTERS	133
2	ABC DATA PRODUCTS	188
3	ALF PRODUCTS INC.	156
4	ALPHA SOFTWARE CORP.	10
5	AMERICAN PEOPLE/LINK	106
*	ANCHOR AUTOMATION	157
*	APPLE COMPUTER	4, 5
7	ARTFCL.INTLLG.RSRCH.GRP.	188
8	BORLAND INTERNATIONAL	51
10	CALYX INC.	135
11	CDEX	134
12	CITIZEN AMERICA CORP.	32, 33
13	CODEWRITER CORP.	45
14	CODEWRITER CORP.	162
15	COLUMBIA HOUSE	151
16	COMPUPRO	34
17	COMPUSERVE	7
*	COMPUTER BOOK CLUB	129
*	COMPUTER CHRONICLES	162
18	COMPUTER MAIL ORDER	183
*	COMPUTER NOVELTY CORP.	165
*	COMPUTER WAREHOUSE	149
20	CUESTA SYSTEMS	143
21	DATA EXCHANGE	135
22	DATA EXCHANGE	188
25	DISCWASHER	42
26	DISK WORLD, INC.	178
27	DOW JONES NEWS/RETRIEVAL	85
91	DOW JONES SOFTWARE	37
92	DOW JONES SOFTWARE	56
93	DOW JONES SOFTWARE	57
30	DYNAX INC.	122
*	EASTMAN KODAK	8, 9
82	FUJI	66, 67
32	GARDEN OF EDEN COMPUTERS	163
85	GREAT PLAINS SOFTWARE	136
33	H & E COMPUTRONICS	15
34	HEATH CO.	155
35	HEWLETT-PACKARD	79
81	IBM	92, 93
36	IBM (ISG DIV)	112
37	INFOCOM	48, 49
38	JENSEN TOOLS INC.	164
39	JUKI AMERICA	68
40	KRAFT SYSTEMS	154
41	KRELL SOFTWARE	166
42	LEADING EDGE PROD	CII
43	LEADING EDGE PROD	1
44	LEADING EDGE PROD	38
9	LEGEND PERIPH. PROD.	153
*	LOTUS	58, 59
87	MAGNUM P.C.	146
*	MCGRAW-HILL (CES) BOOK CO.	81
45	MECA	145
46	MICRO PRO INT'L.	12, 13
47	MICRO SCI	111
48	MICRO-ART PROGRAMMERS	188
49	MICROCOMPUTER INFO SRV.	188
*	MICROSOFT CPD	40, 41
*	MICROSOFT CPD	130
78	MULTITECH	31
83	NCR	75
*	NEBS COMPUTER FORMS	120
51	NEC INFORMATION SYS.	103
52	NETWORX	16
53	NIBBLE NOTCH COMP. PROD.	45
*	NORTH HILLS CORP.	165
*	NORTH HILLS CORP.	188
*	NRI SCHOOLS	161
55	OLDEN CAMERA	142
56	OPEN SYSTEMS	52
57	OPUS COMPUTER PRODUCTS	39
86	PEACHTREE SOFTWARE	CIII
*	POPULAR COMPUTING BACK ISSUES	187
*	POPULAR COMPUTING SUBSCRIBER MESSAGE	116
*	POPULAR COMPUTING SUBSCRIBER SERVICE	154
58	PRECISION DATA PRODUCTS	164
59	PRINCETON GRAPHIC SYS.	26
79	PROTECTO ENTERPRIZES	100
80	PROTECTO ENTERPRIZES	101
61	QUARK INC.	119
62	RADIO SHACK	CIV
63	RCA	139
64	RELAX TECHNOLOGY	28
65	SATELLITE SOFTWARE INT'L	127
66	SL WABER	30
*	SHANNON SOFTWARE LTD.	188
67	SHAPE MAGNETRONICS	140
84	SIMON & SCHUSTER	154
68	SMART DATA	135
69	SMART DATA	165
70	SOFTEXT PUBLISHING CORP.	188
*	SOFTWARE PUBLISHING	25
71	SOURCE, THE	159
72	TEKNIKA ELECTRONICS	18
73	TELETYPEWRITER PAPER SUPPLIES	188
74	TELOS INC.	141
75	THORN EMI	119
76	VEN-TEL INC.	55
*	WAREHOUSE DATA PRODUCTS	150
*	XEROX EDUCATION PUB.	47

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1	11	21	31	41	51	61	71	81	91	101	111	121	131	141	151	161	171	181	191	201	211	221	231	241	251	261	271	281	291
2	12	22	32	42	52	62	72	82	92	102	112	122	132	142	152	162	172	182	192	202	212	222	232	242	252	262	272	282	292
3	13	23	33	43	53	63	73	83	93	103	113	123	133	143	153	163	173	183	193	203	213	223	233	243	253	263	273	283	293
4	14	24	34	44	54	64	74	84	94	104	114	124	134	144	154	164	174	184	194	204	214	224	234	244	254	264	274	284	294
5	15	25	35	45	55	65	75	85	95	105	115	125	135	145	155	165	175	185	195	205	215	225	235	245	255	265	275	285	295
6	16	26	36	46	56	66	76	86	96	106	116	126	136	146	156	166	176	186	196	206	216	226	236	246	256	266	276	286	296
7	17	27	37	47	57	67	77	87	97	107	117	127	137	147	157	167	177	187	197	207	217	227	237	247	257	267	277	287	297
8	18	28	38	48	58	68	78	88	98	108	118	128	138	148	158	168	178	188	198	208	218	228	238	248	258	268	278	288	298
9	19	29	39	49	59	69	79	89	99	109	119	129	139	149	159	169	179	189	199	209	219	229	239	249	259	269	279	289	299
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300

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Fair	3	7	11	15	19	23	27	31	35	39	43	47	51
Poor	4	8	12	16	20	24	28	32	36	40	44	48	52

Article no.	14	15	16	17	18	19	20	21	22	23	24	25
Excellent	53	57	61	65	69	73	77	81	85	89	93	97
Good	54	58	62	66	70	74	78	82	86	90	94	98
Fair	55	59	63	67	71	75	79	83	87	91	95	99
Poor	56	60	64	68	72	76	80	84	88	92	96	100

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9	19	29	39	49	59	69	79	89	99	109	119	129	139	149	159	169	179	189	199	209	219	229	239	249	259	269	279	289	299
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300

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7	17	27	37	47	57	67	77	87	97	107	117	127	137	147	157	167	177	187	197	207	217	227	237	247	257	267	277	287	297
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